THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XIV. Part 11. 10th November, 1916.

MILLING AND BAKING TESTS OF VICTORIAN WHEAT.

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Introductory.

Since the establishment of the experimental mill and baking oven, several articles have appeared in former issues of this *Journal* dealing with the milling and baking qualities of Victorian wheats, grown on the experimental farms at Longerenong, Werribee, and Rutherglen. This work was started with the object of assisting the farmer in some practical manner in growing the varieties best adapted to this State, which are not only high yielding varieties, but possess the best chemical, milling, and baking characteristics. At present the variety mostly in favour with the farmer is the one that will fill the greatest number of bags per acre; with the miller, the sample that will return the greatest number of bags of flour per ton; with the baker, the flour that will return the greatest number of loaves per sack. The present article is a continuation of this work. During the past year nineteen varieties of named wheats and a number of unnamed crossbreds have been taken for the test.

A new departure was made in the process of manipulating the wheat before milling; formerly the sample was conditioned straightway, and consequently the flour in some cases was found to suffer in appearance. By means of a specially-designed apparatus for cleaning the wheat, it was possible to conform more closely to the treatment given to the wheat in a large mill. The effect of this treatment is strikingly illustrated in the difference between the bushel weight of this season's f.a.q. sample before and after cleaning. The cleansed wheat shows an advantage of 4 lbs. per bushel over the uncleaned sample. In addition, the flour from the cleaned wheat has a better appearance, owing to the elimination of the particles of dust, &c., which formerly found their way into it

Longerenong.

The following table gives a summary of the tests made on fourteen commonly grown varieties, and six of the most promising of the unnamed crossbreds which were grown at Longerenong:—

TABLE I.

RESULTS OF MILLING TEST ON WHEAT GROWN AT LONGERENONG, SEASON 1915-16.

Variety.	Yield per Acre.	Bushels Weight.	Crude Protein in Wheat.	Flour Yield.	Strength, Water Absorption Capacity.	Gluten.		Crude Protein in Flour.	Colour, 20 points max.	Moisture in Wheat.	Moisture in Flour
						Wet.	Dry.				
	bh. lb.	lb. oz.	per cent.	per cent.	qts.	per cent.	per cent.	per cent.		per cent.	per cent.
American 8 ..	40 30	68 7	12·75	74 2	50·0	30·70	10·52	11·18	19·5	10·84	13·11
Bayah	40 15	67 6	13·00	71·5	52·4	27·08	11·25	11·25	15·5	11·16	12·96
Bunyip	32 15	66 2	13·62	75·0	52·8	33·31	11·56	11·87	18·5	11·40	13·04
Selected Bunyip ..	..	65 4	13·31	68·5	49·8	32·69	11·13	11·99	18·5	11 47	13·11
College Eclipse ..	42 45	68 1	12·69	72·5	53·8	33·56	11·67	11·68	19·0	10·7.	13·02
Currawa	42 30	66 8	12·69	73·2	49·8	25·70	8·75	11·44	18·5	11·18	13·01
De Ut's Imperial ..	45 55	67 6	13·24	72·7	50·0	27·05	8·23	11·50	18·5	10·99	13 00
Selected Federation	54 32	67 3	10·25	72·7	47·8	28·17	7·26	9·25	18·0	11·16	13·0
Bulk Federation ..	52 30	67 0	10·99	72·5	47·6	24·91	7·72	9·87	17·5	11·31	13 30
Gluya	45 5	66 5	11·25	75·0	51·2	27·82	8·72	10·50	18·5	10·84	13·40
Huguenot	30 2	63 3	15·93	78·0	57·6	48·45	15·25	14·93	3·0	10·04	13·10
King's Early ..	34 30	67 4	13·37	71·0	51·0	32·80	11·45	12·69	17·5	10·85	13·30
Major	54 25	67 1	11·25	71·9	51·0	27·87	9·38	10·37	18·5	11·27	13·04
Marshall's No. 3 ..	54 52	67 4	10·74	74·0	50·6	25·67	9·06	10·12	18·0	11·32	13·47
Viking	39 52	66 8	10·99	73·4	51·6	23·68	9·24	10·37	19·5	11·10	13·60
Yandilla King ..	54 27	67 00	8 11·05	76·0	52·4	29·00	9·72	10·50	18·5	11·60	13 27
CROSSBREDS.											
Bobs × Federation ..	40 33	67 4	10·87	72·0	52·0	23·98	8·40	9·49	17·0	11·61	13·44
Indian F × Federation	44 30	67 6	11·93	73·0	53·4	28·38	10·35	10·99	19·5	10·83	12·93
Indian F × Federation	38 47	67 3	10·37	72·7	52·6	25·28	8·77	9·43	19·5	10·80	13·20
Stanley × Yandilla King	42 21	66 3	10·74	74·9	50·6	27·40	9·27	10·50	19·0	11·09	13·20
Indian F × Comeback	58 0	67 4	10·12	73·7	52·0	23·97	8·35	9·62	18·0	11·49	13·60
Thew × Comeback	41 22	67 9	12·12	73·0	52·6	32·60	10·14	11·37	18·0	10·84	12·40

The average quality of the wheats grown at Longerenong is highly satisfactory. Where variations are noted they are not so marked as in former tests. The main points observed are—the bushel weight, percentage of flour, water absorption capacity, and the gluten content.

The bushel weight was, on the average, high, ranging from American 8, 68 lbs. 7 oz., to Huguenot, 63 lbs. 3 oz. The yield of flour ranged from Huguenot, 78 per cent., to King's Early, 71 per cent., exclusive of selected Bunyip, which gave an indifferent yield. The water absorption capacity is usually the most variable. Huguenot, as was to be expected, shows the highest figure. College Eclipse is also worthy of mention, taking 53.8 quarts per sack. This may be considered as a fairly high quantity, and would indicate in some measure that this wheat is well suited to the district. Federation, with 47.6 quarts per sack, shows the lowest test of all varieties grown at this farm. The difference of over 6 quarts of water per sack of flour would favour College Eclipse in

the eyes of the baker. The highest content of gluten was held by College Eclipse, 11.67 per cent., and the lowest by Federation, 7.26 per cent. All the flours milled were of a good colour, with the exception of Huguenot. The general average of the wheats in all respects was higher than this year's f.a.q. sample. Among so many wheats showing such good results at Longerenong, it is difficult to mark out any worthy of special notice. The following, in order of merit for quality, may be mentioned:—College Eclipse, Bunyip, Bayah, American 8, King's Early, and Yandilla King.

The six unnamed crossbreds all gave satisfactory returns, and seem worthy of further trial. Mention may be made of Indian F x Federation and Thew x Comeback as being high in gluten, returning a good percentage of flour and bushel weight. Indian F x Comeback returned about 4 bushels per acre more than Federation.

Werribee.

Sixteen named varieties and thirteen unnamed crossbreds constituted the lot tested from the wheats grown at the Werribee Research Farm.

TABLE II.

RESULTS OF MILLING TESTS ON WHEATS GROWN AT WERRIBEE.

Variety.	Yield of Variety in Field Plots.	Bushel Weight of Clean Wheat.	Protein Content in Wheat.	Flour Yield.	Strength, Water Absorption Capacity.	Gluten.		Nitrogen Content.	Crude Protein in Flour.	Colour, 20 points mark.	Moisture in Wheat.	Moisture in Flour.
						Wet.	Dry.					
	lb. lb.	lb. oz.	per cent.	per cent.	qts.	per cent.	per cent.	per cent.	per cent.		per cent.	per cent.
College Eclipse ..	23 6	67 4	9·87	72·5	52·0	29·24	9·57	1·50	9·37	15·5	11·97	13·02
Comeback	17 30	67 1	11·31	71·2	55·2	28·67	10·78	1·71	10·68	16·0	12·34	13·30
Commonwealth ..	23 12	64 4	9·06	69·0	45·2	22·55	8·21	1·36	8·50	15·5	12·04	13·09
Currawa	20 24	66 2	10·68	68·5	48·5	25·16	8·49	1·59	9·94	15·5	12·48	12·9
Dart's Imperial ..	20 0	65 7	8·12	71·0	50·0	23·50	8·34	1·30	8·12	15·5	12·63	13·13
Federation	26 0	65 5	9·12	69·5	46·2	20·29	7·47	1·34	8·38	15·5	12·58	13·10
Gluyas	20 6	66 5	10·00	72·7	50·4	25·25	8·77	1·52	9·49	16·0	12·64	13·2
Huguenot	11 36	63 1	17·05	74·8	58·2	54·20	15·91	2·73	17·07	2·0	12·20	13·5
King's Early ..	24 54	66 5	10·93	70·0	48·4	32·80	10·74	1·63	10·18	16·5	12·56	12·7
Mac's White ..	15 12	64 1	9·49	71·8	50·6	33·77	7·49	1·39	8·69	16·0	12·51	13·3
Major	24 24	66 0	8·81	72·9	46·2	26·00	7·01	1·40	8·75	15·5	12·49	13·1
Marshall's No. 3 ..	20 42	65 4	12·06	71·0	48·0	25·29	7·95	1·82	11·37	15·0	11·99	13·03
Penny	25 18	64 6	8·75	72·9	48·8	19·41	6·99	1·31	8·19	16·5	12·01	13·02
Warden	19 6	66 5	10·50	74·2	47·6	25·67	10·29	1·55	9·68	16·0	11·91	11·04
Yandilla King ..	24 54	66 2	9·19	75·0	40·0	29·25	9·51	1·38	8·63	15·5	12·00	13·01
Zealand Blue ..	8 12	66 5	10·50	74·5	49·2	23·78	7·00	1·54	9·62	15·5	11·60	12·71
Crossbred, 784 ..	23 42	65 5	12·12	71·2	50·2	29·39	9·89	1·79	11·18	16·0	12·30	12·96
,, 265 ..	22 48	63 9	11·37	68·1	48·8	32·67	10·20	1·73	10·81	16·0	13·21	12·30
,, 298 ..	17 54	61 3	14·00	71·7	48·4	38·78	12·84	2·14	13·37	17·5	12·39	13·3
,, 304 ..	19 24	62 6	12·09	70·9	52·0	31·37	11·05	1·87	11·68	16·0	12·41	13·2
4050 ..	23 0	63 9	10·99	75·0	50·2	28·81	8·35	1·58	9·87	16·0	12·51	13·1
4056 ..	18 24	64 6	11·05	69·0	56·0	33·10	10·68	1·59	9·94	18·5	12·02	13·1
4059 ..	23 30	65 5	9·81	72·5	49·4	23·96	7·82	1·34	8·38	15·0	12·78	13·4
4071 ..	30 80	66 3	8·87	70·5	47·4	20·91	7·20	1·20	7·50	15·0	12·52	13·4
4101 ..	21 24	61 3	8·30	74·7	56·4	18·94	6·43	1·20	7·50	20·0	12·46	12·8
4102 ..	20 6	63 6	10·99	74·0	62·0	32·30	9·67	1·62	10·12	7·0	12·29	12·94
4106 ..	21 0	64 1	10·12	69·2	50·6	25·50	8·74	1·45	9·06	17·5	12·10	13·1
4108 ..	23 8	64 7	7·56	68·1	50·6	22·00	6·96	1·21	7·56	17·5	12·25	13·1
,, 4109 ..	22 18	64 6	7·43	71·2	47·6	17·56	5·82	1·19	7·44	14·5	12·39	13·2

The average quality and bushel weight of the wheats from Werribee were lower than from Longerenong. The yield of flour varied from Yandilla King, 75 per cent., to Currawa, 68.5 per cent. Three varieties gave under 70 per cent. (Commonwealth, Currawa, and Federation). The water absorption capacity varied between Comeback, 55.2 quarts, and Commonwealth, 45.2 quarts. College Eclipse shows a good strength and high yield. The gluten content varied between Comeback, 10.78 per cent., to Penny, 6.99 per cent. The colour of the flours was indifferent. The following may be mentioned as showing the best quality on this farm:—Warden, Yandilla King, College Eclipse, Comeback, Gluyas and Zealand Blue. Among the crossbreds special mention may be drawn to Nos. 4102 and 4050. No. 4102 is remarkable for its high water absorption capacity, and No. 4050 for a high flour yield and water absorption capacity

Rutherglen.

Twelve named varieties and ten unnamed crossbreds comprise the number tested from Rutherglen Experimental Farm.

TABLE III.

RESULTS OF MILLING TESTS ON WHEATS GROWN AT RUTHERGLEN.

Variety.	Yield of Variety in Field Plots.	Bushel Weight of Harvested Sample.	Protein Content in Wheat.	Flour Yield.	Strength, Water Absorption Capacity.	Gluten.		Nitrogen Content.	Crude Protein in Flour.	Colour, 20 points max.	Moisture in Wheat.	Moisture in Flour.
						Wet.	Dry.					
	bh. lb.	lb. oz.	per cent.	per cent.	qts.	per cent.	per cent.	per cent.	per cent.		per cent.	per cent.
American	15 40	67 1	10·81	70·9	48·2	21·4	8·2	1·57	9·81	18·0	9·0	11·08
College Eclipse ..	18 40	65 9	10·93	74·0	47·6	25·3	9·81	1·57	9·81	18·5	9·1	11·04
Commonwealth ..	15 20	64 7	8·62	71·6	46·0	18·0	6·5	1·26	7·94	15·0	9·7	11·11
Currawa	21 20	65 5	10·93	68·5	47·2	19·6	7·0	1·56	9·74	18·0	9·6	10·85
Dart's Imperial ..	15 20	64 1	10·50	72·4	16·2	21·0	7·3	1·52	9·49	18·0	9·2	12·05
Federation	21 40	65 2	9·31	73·7	49·4	22·1	7·3	1·37	8·56	17·5	8·6	10·28
Gluyas	17 40	64 6	9·55	72·2	49·2	18·8	7·3	1·40	8·75	19·5	9·2	11·09
King's Early ..	20 0	64 6	10·31	73·1	48·4	24·2	8·5	1·51	9·43	15·5	9·0	10·41
Marshall's No. 3 ..	18 40	65 1	9·62	74·4	48·0	18·7	7·2	1·44	9·00	18·0	9·2	11·23
Penny	22 20	62 2	10·37	73·9	49·4	20·2	7·5	1·47	9·19	15·5	9·5	11·74
Viking	16 20	64 6	8·62	70·3	46·2	18·7	6·8	1·27	8·00	15·5	10·2	12·48
Yandilla King ..	15 40	64 1	9·49	75·5	50·2	18·8	7·7	1·40	8·75	15·5	9·3	11·64
Crossbred 1 ..	..	68 1	9·81	73·5	51·0	20·8	7·6	1·44	9·00	18·5	8·9	11·43
,, 2. ..	..	68 1	10·12	75·3	51·0	20·2	7·4	1·47	9·19	18·0	9·5	11·92
,, 3 ..	..	67 8	9·31	73·9	48·6	19·6	7·2	1·38	8·62	17·0	8·8	11·37
,, 4006 ..	..	64 1	11·25	71·5	50·2	24·9	9·0	1·62	10·12	16·5	9·2	11·60
,, 4049 ..	..	64 7	9·49	70·5	49·2	19·6	6·9	1·45	9·06	16·5	8·8	11·69
,, 4051 ..	..	64 7	9·62	80·0	63·4	24·3	8·6	1·45	9·06	3·0	8·7	11·90
,, 4056 ..	..	66 8	10·12	71·0	58·4	28·1	9·0	1·54	9·62	19·0	8·7	11·06
,, 4061 ..	..	66 2	11·87	73·7	53·0	26·8	8·7	1·80	11·25	17·5	8·3	11·55
,, 4069 ..	..	65 5	9·00	72·7	50·8	20·5	6·8	1·35	8·44	17·5	8·6	11·39
,, 4078 ..	..	65 7	11·44	73·2	49·4	32·5	11·0	1·76	10·99	20·0	8·9	11·42
Victorian f.a.q ..	..	clean 65 7 dirty 61 5	10·06	70·6	49·0	23·2	8·0	1·50	9·37	15·5		12·60

The dirty bushel weight is that of the original f.a.q. wheat.

The quality of the wheat from this district is poor compared with tests of previous years. The bushel weight is fairly high. The flour yield varied from Yandilla King, 75.5 per cent., to Viking, 70.3 per cent. Currawa, however, yielded only 68.5 per cent. The water absorption capacity varied from Yandilla King, 50.2 quarts, to Commonwealth, 46.0 quarts. The gluten content ranged from College Eclipse, 9.81 per cent., to Currawa, 7.0 per cent. The colour of the flour was, on the average, better than that from the Werribee wheats, but inferior to that from Longerenong. Among the crossbred wheats some exceptional ones may be picked out. No. 4051 returned 80 per cent. of flour of high strength. No. 4056 also gave a good flour yield of high strength. No. 4078 shows evidence of a good all-round quality. The following varieties may be considered as showing the best results at this farm: — College Eclipse, King's Early, American 8.

Yield and its Relation to Rainfall.

The yield per acre and its relation to the rainfall during the growing season will now be considered. This will be shown in Tables IV. and V. by comparing the results obtained from eight named varieties which were grown in each district. The varieties were—

Gluyas and King's Early—early varieties.

Dart's Imperial and Federation—mid-season varieties.

College Eclipse, Currawa, Marshall's No. 3, and Yandilla King—late varieties.

Table IV.

Rainfall During the Growing Season 1915.

	Longerenong. Points.	Werribee. Points.	Rutherglen. Points.
June	127	156	349
July	380	157	361
August	156	139	198
September	238	166	291
October	409	191	237
November	90	62	287
Total	14·00 inches	8·71 inches	17·17 inches

Table V.

Yield per Acre of Wheats.

	Longerenong. Bushels per acre.	Werribee. Bushels per acre.	Rutherglen. Bushels per acre.
College Eclipse ..	42·45	23·6	18·40
Currawa ..	42·30	20·24	21·20
Dart's Imperial ..	45·55	20·6	15·20
Federation ..	54·32	26·0	21·40
Gluyas ..	45·5	20·6	17·40
King's Early ..	34·3	24·54	20·0
Marshall's No. 3 ..	54·52	20·42	18·40
Yandilla King ..	54·27	24·54	15·40

Although the most rain fell at Rutherglen during the growing season, the yield from this farm was the lowest per acre. At Rutherglen

the winter proved to be the wettest on record, no less than 17.17 inches falling during the growing period. The flat land on which the experimental plots were situated was water-logged, with the result that the yield was greatly reduced.

The variation in composition due to differing soils and climatic conditions is here shown:—

TABLE VI.

	Bushel Weight.	Crude Protein in Wheat.	Flour.	Water Absorption Capacity.	Gluten.		Crude Protein in Flour.	Moisture	
					Wet.	Dry.		In Wheat.	In Flour.
	lbs. oz.	%	%	quarts.	%	%	%	%	%
Longerenong	67 3	11·88	73·40	50·8	28·30	9·41	11·04	11·10	13·30
Werribee ..	66 2	9·99	72·5	49·06	26·34	8·85	9·43	12·36	13·61
Rutherglen	64 9	10·02	72·97	48·25	21·06	7·79	9·31	9·16	11·32

A general decline in quality may be noted in the composition of the average sample of the wheats grown at these farms. Wheats grown at Longerenong, generally speaking, are superior in quality to those grown at Werribee and Rutherglen.

Table VI. offers a comparison between the variation in general composition of a number of wheats grown in different districts during the past year. Table VII. compares the protein content of a number of named varieties grown at Longerenong and Rutherglen during the past four years.

TABLE VII.

	Crude Protein Content of Wheats grown at—							
	Longerenong.				Rutherglen.			
	1912.	1913.	1914.	1915.	1912.	1913.	1914.	1915.
	%	%	%	%	%	%	%	%
American 8	12·56	13·69	14·06	12·75	12·50	12·31	..	10·81
Dart's Imperial ..	10·62	11·21	12·18	12·24	12·94	13·62	..	10·05
Federation	11·62	9·19	12·62	10·99	11·62	11·31	14·93	9·31
Olynyas	11·37	10·94	13·18	11·25	11·44	12·06	..	9·55
King's Early	14·00	12·25	14·74	13·37	13·81	12·69	..	10·21
Marshall's No. 3 ..	10·31	10·75	..	10·74	11·56	12·06	..	9·02

PROLIFICACY IN ITS RELATION TO STRENGTH.

The wheats most popular with the grower include those noted as being good yielding varieties, the question as to whether they are strong or weak being a secondary consideration. The strength of a flour is measured by its water absorption capacity. The two characteristics, viz., prolificacy and strength, are not usually found associated in any one variety. The commonly grown varieties in this State all belong to the soft wheats, very few of which are noted for high strength. Considerable variations occur in this characteristic, but, as a rule, we find

high strength and low yielding power associated in the one wheat. A typical high-strength wheat, Comeback, does not fill the sacks, and is, in consequence, not a popular variety with the grower, but would be readily bought by the miller. One variety, College Eclipse, at Longerenong and Werribee showed the highest strength of the eight varieties named, see Table V. The yield at each farm was midway between the highest and the lowest. The popular variety, Federation, on the other hand, shows at these farms the best yield and the lowest strength.

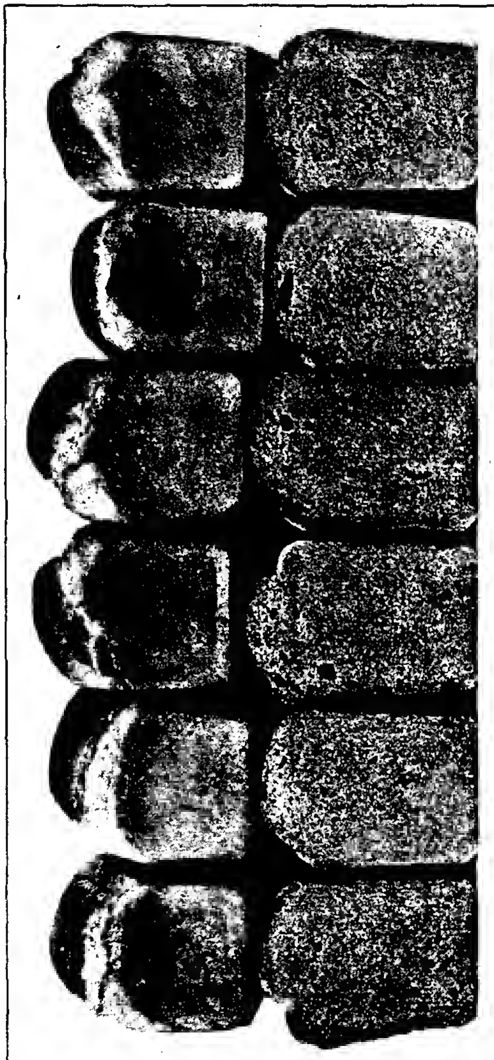
TABLE, VIII.

RESULTS OF BAKING TESTS ON WHEAT FROM LONGERENONG.

Variety.	Colour, 20 points max.	Texture, 20 points max.	Weight, grains.	Volume, c.c.	Water used in Doughing c.c.	Points for General Appearance.	Remarks.
American 8 ..	18	19	478	1,445	212	19	Rose very well in oven, fair crust and appearance
Bayah	20	20	494	1,550	222	20	Rose very well in oven, very good crust and appearance
Bunyip	20	20	495	1,620	221	20	Very fair rise in oven, very good crust and appearance
Bunyip (Selected) ..	19	19	485	1,550	211	18	Very good rise in oven, very good crust and appearance
College Eclipse ..	19	19	502	1,345	228	16	Slight rise in oven, fair crust
Currawa	20	19	494	1,620	211	20	Rose very well in oven, very good crust and appearance
Dart's Imperial ..	19	18	487	1,470	212	20	Very fair rise in oven, very good crust and appearance
Federation (Selected)	18	18·5	479	1,520	203	20	Very good rise in oven, good crust, slightly foxy appearance
Federation (Bulk) ..	19·5	20	476	1,705	202	20	Rose very well in oven, excellent crust and appearance
Guyas	19	19·3	489	1,510	217	20	Rose very well in oven, excellent crust and appearance
Huguenot	17	17	525	1,315	245	15	Fair rise in oven, very long fermentation, sugary appearance of loaf
King's Early ..	20	20	483	1,485	214	20	Very fair rise in oven, very good crust
Major	19	17	488	1,490	216	18	Very fair rise in oven, fair crust and appearance
Marshall's No. 3 ..	18	18	486	1,460	215	18	Very fair rise in oven, fair crust and appearance
Viking	18	17	491	1,455	219	20	Very fair rise in oven, very good crust and appearance
Yandilla King ..	20	17	494	1,145	222	18	Slight rise in oven, very good crust and appearance
Bobs × *Federation* A	19	19	490	1,550	221	19	Very good rise, good crust and appearance
Indian F × Federation B	16	18	496	1,500	228	20	Very good rise, good crust and appearance
Indian F × Federation C	16	18	493	1,505	223	20	Very good rise, good crust and appearance
Stanley × Yandilla King	18	18	485	1,520	215	18	Very good rise in oven, crust rough and foxy
Indian F × Comeback	20	19·5	493	1,500	221	20	Very good rise in oven, crust good
Thew × Comeback ..	19	17	496	1,505	223	19	Very good rise in oven, crust pale

BAKING QUALITIES.

Good loaves, as regards general appearance and volume, but lacking in texture and colour, were baked from the flour of the following varieties of wheat grown at Longerenong:—Bayah, Bunyip, Currawa,



No. 1. Federation. No. 2. Crossbred 3. No. 3. Victorian. F.A.Q. No. 4. Crossbred 4049. No. 5. Crossbred 4078. No. 6. Crossbred 4069.

Plate 1.—Loaves Baked from Flours Milled from Four of the New Crossbred Wheat grown at Rutherglen, compared with Loaves Baked from Federation and F.A.Q. Wheats.

Federation, and Gluyas. College Eclipse, although amongst the varieties showing good milling quality, gave disappointing returns on baking. It would, however, be a good wheat for blending with other weaker wheats. The Werribee wheats produced a few flours of good baking quality. The majority of the loaves were lacking in texture and colour, but gave fairly large loaves of good general appearance. The most satisfactory loaves were baked from Commonwealth, Penny, Currawa, and College Eclipse flours.

TABLE IX.

RESULTS OF BAKING TESTS ON WHEAT FROM RUTHERGLEN.

Variety.	Colour, 20 points max.	Texture, 20 points max.	Weight, grains.	Volume, c.c.	Water used in Doughing, c.c.	Points for Appearance, 20 points max.	Remarks.
American 8	15	16	474	1,450	204	18	Proving slow, rose well in oven, very good crust, appearance, and colour
College Eclipse ..	11	14	475	1,445	202	14	Proving slow, rose well in oven, crust inclined to be foxy
Commonwealth ..	18	18	429	1,525	193	14	Proving slow, rose well in oven, crust inclined to be foxy
Currawa	15	17	472	1,545	200	14	Rose well in oven, very good crust and appearance
Dart's Imperial ..	15	15	471	1,500	196	20	Rose well in oven, very good crust and appearance
Federation	17	17	488	1,495	207	19	Rose well in oven, crust slightly foxy
Gluyas	15	15	475	1,550	209	17	Rose fairly well in oven, very good crust
King's Early ..	16	15	479	1,520	203	17	Proving very slow, rose well in oven, crust foxy
Marshall's No. 3 ..	17	19	474	1,445	201	16	Rose well in oven, fair crust, foxy appearance
Penny	18	18	476	1,500	200	16	Rose well in oven, foxy crust
Viking	15	18	472	1,510	196	16	Proving very fast, foxy crust
Vanuilla King ..	15	18	473	1,480	213	16	Rose well in oven, crust very good
Crossbred, 1 ..	16	18	492	1,400	214	18	Rose well in oven, crust slightly pale
,, 2 ..	16	16	493	1,480	214	18	Rose well in oven, crust very good
,, 3 ..	16	18	477	1,520	206	20	Rose well in oven, crust very good
,, 1006 ..	16	15	498	1,610	213	20	Rose well in oven, crust very good
,, 4049 ..	16	16	490	1,540	209	20	Proving very slow, slight rise in oven, crust had sugary appearance
,, 4051 ..	10	14	528	1,410	264	16	Proving fairly fast, very good rise in oven, very good crust
,, 4056 ..	14	14	504	1,510	248	19	Proving fairly fast, very good rise in oven, very good crust
,, 4061 ..	18	18	486	1,448	222	19	Proving fairly fast, very good rise in oven, very good crust
,, 4069 ..	15	18	484	1,470	216	20	Proving fair, very good rise in oven, good crust and appearance
,, 4078 ..	16	16	487	1,480	209	18	Very fair rise in oven, very good crust and appearance
Victorian Ind. Sample	18	20	491	1,555	212	20	Very good rise in oven, very good crust and appearance of loaf

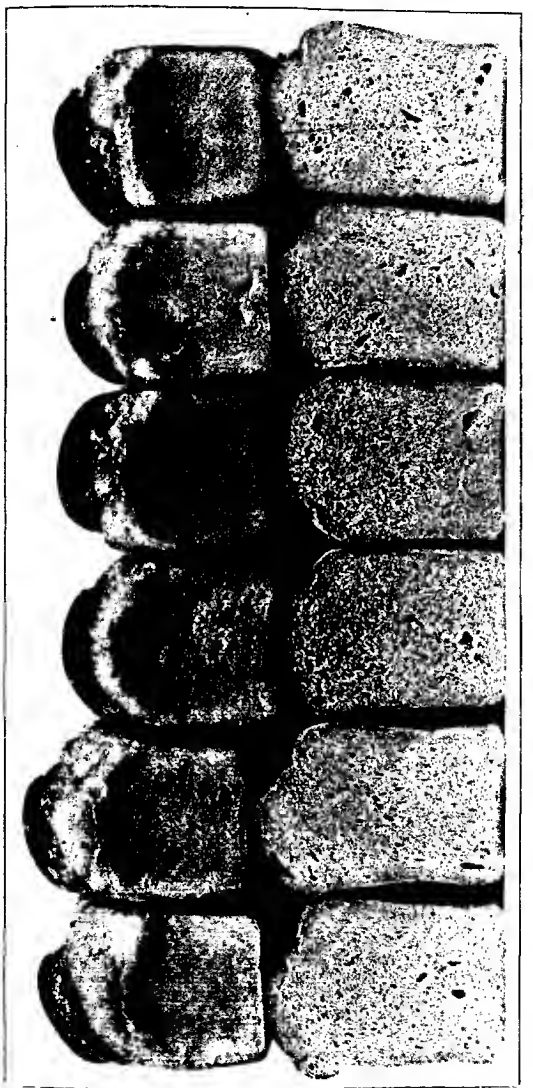
From the Rutherglen wheats, although good volumed loaves were baked, the average loaf was poor in colour, texture, and general appearance. The varieties which gave the best loaves were Commonwealth, Currawa, Dart's Imperial, and Gluyas.

As a blend of two or more flours generally produces a better loaf than a flour of a single variety, a blend was made of the flour from each

Table X.

Results of Baking Tests on Wheat from Werribee.

Variety.	Colour, 20 points max.	Texture, 20 points max.	Weight, grains.	Volume, c. c.	Water used in Doughing, c. c.	Points for Appearance, 20 points max.	Remarks.
College Eclipse ..	16	15	496	1,520	221	20	Rose very well in oven, very good crust and appearance
Comeback ,, ..	20	18	499	1,500	234	20	Rose very well in oven, very good crust and appearance
Commonwealth ..	16	15	473	1,610	192	20	Rose very well in oven, very good crust and appearance
Currawa ,, ..	16	15	490	1,490	205	20	Rose very well in oven, very good crust and appearance
Dart's Imperial ..	14	14	485	1,500	212	18	Very fair rise in oven, foxy appearance of crust
Federation	17	17	474	1,410	196	18	Fair rise in oven, foxy appearance of crust
Gluyas	16	16	490	1,420	214	18	Fair rise in oven, foxy appearance of crust
Huguenot	7	6	512	1,420	233	10	Overworked in proving, dropped back in oven
King's Early ..	14	14	475	1,335	205	16	Poor rise in oven, fair appearance of loaf
Mac's White ..	16	16	488	1,450	212	18	Fair rise in oven, fair appearance of loaf
Major ,, ..	17	17	474	1,380	191	18	Fair rise in oven, fair appearance of loaf
Marshall's No. 3 ..	14	14	477	1,440	204	18	Fair rise in oven, fair appearance of loaf
Penny ,, ..	18	17	484	1,630	207	20	Very good rise in oven, very good appearance of crust
Warden	14	14	480	1,420	202	17	Very fair rise in oven, crust foxy appearance
Yandilla King ..	15	16	484	1,410	206	17	Very fair rise in oven, crust foxy appearance
Zealand Blue ..	17	17	485	1,450	209	17	Very fair rise in oven, crust foxy appearance
Crossbred 78A ...	16	17	489	1,460	213	17	Very fair rise in oven, crust foxy appearance
,, 265 ..	16	14	481	1,390	207	18	Very fair rise in oven, crust foxy appearance
,, 298 ..	17	18	478	1,330	205	15	Slight rise in oven, fair colour and appearance
,, 304 ..	18	17	494	1,490	228	20	Rose fairly well in oven, good crust and appearance
,, 4050 ..	19	17	520	1,465	249	18	Rose well in oven, good crust and appearance, good variety for blending with weak wheats
,, 4056 ..	16	16	501	1,450	233	17	Fair rise in oven, crust inclined to be foxy
,, 4059 ..	16	16	485	1,450	209	19	Fair rise in oven, crust inclined to be foxy
,, 4071 ..	19	17	480	1,480	201	20	Very good rise in oven, very good crust and appearance of loaf
,, 4101 ..	16	16	479	1,300	214	16	Fair rise in oven, crust rough and fiery
,, 4102 ..	16	18	519	1,490	263	17	Rose well in oven, should be an excellent variety for blending with soft weak wheats, excellent flavour
,, 4106 ..	18	18	475	1,410	212	20	Rose well in oven, very good crust and appearance
,, 4108 ..	17	17	476	1,450	215	20	Rose well in oven, very good crust and appearance
,, 4109 ..	16	17	472	1,600	202	17	Rose well in oven, crust foxy
F.A.Q., 1915–1916 ..	18	20	491	1,555	212	20	Very good rise in oven, very good crust and appearance of loaf



No. 1. Varieties, Rutherglen. No. 2. Crossbreds, Rutherglen. No. 3. Varieties, Werribee. No. 4. Crossbreds, Werribee. No. 5. Varieties, Longerenong. No. 6. Crossbreds, Longerenong.

Plate 2.—Loaves Baked from the Blended Flours Milled from Wheats grown at Rutherglen, Werribee, and Longerenong.

variety, and in a similar manner of the crossbreds. The blended flours were afterwards baked with the following results, as shown in Table XI.:—

TABLE XI.

Result of baking test of blends of the varieties and crossbred wheats grown at Rutherglen, Werribee, and Longerenong:—

Variety.	Colour, 20 points max.	Texture, 20 points max.	Weight in Grains.	Volume, c.c.s.	Water used in Dough, c.c.s.	Points for Appearance, 20 points max.	Remarks.
Rutherglen—							
Varieties ..	18	20	479	1,600	212	20	Very good rise in oven, good crust and appearance
Crossbreds ..	18	20	481	1,620	228	20	" " " "
Werribee—							
Varieties ..	19	19	483	1,545	209	20	" " " "
Crossbreds ..	19	19	486	1,560	228	20	" " " "
Longerenong—							
Varieties ..	19	19	485	1,520	230	20	" " " "
Crossbreds ..	19	19	480	1,580	223	20	" " " "

The blends made from the Rutherglen wheats produced the largest volumed loaves, which were of good texture, but were lacking in colour. Another feature of this test was that all the blends gave loaves of better texture and pile than those produced from the single varieties. Further, the crossbred blends gave the best loaves in all respects.

GLUTEN CONTENT.

When making the gluten test on this season's f.a.q. sample of flour we found the recovered gluten was stronger in character than usual. Further, that flour returning strong gluten will bake a more satisfactory loaf if given an increased quantity of yeast food and more work. Another point worthy of special mention is the regulation of the temperature of the dough during the fermentation. After some experimental tests had been made it was found that a temperature of 80° Fahr. gave satisfactory results. The method we recommend as worthy of adoption for present conditions is, briefly, to use more yeast food, and to allow the fermentation of the dough to proceed at a temperature of 80° Fahr. until the dough is on the point of dropping back. When this stage is reached, it should be punched back, allowed to prove for forty minutes longer, punching back every ten minutes during that period, after which the dough may be moulded. The moulded dough should then be allowed a further forty minutes to prove before being baked.

NOTE ON THE POISONING EFFECT OF THE "JOHNSON GRASS," SORGHUM HALEPENSE.

Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew, England.

Some recent correspondence in the *Indian Forester,* vol. xxxix., Nos. 6 and 10, upon the value of Sorghum halepense, as a fodder grass, and the danger to cattle and horses which its use entails, shows that the exact nature and reactions of the dangerous constituent are not well understood. There is conclusive evidence that the young vegetative parts of S. halepense are, under certain conditions, poisonous to farm animals, and as the plant is, after rice, probably the commonest food and fodder plant in India, besides being much used elsewhere, it has been deemed desirable to publish a short note dealing with the matter.

In 1902 Dunstan and Henry (Phil. Trans. Roy. Soc., A. 199, p. 399) isolated a glucoside, which they called "dhurrin," from the leaves of the great millet (*Sorghum vulgare*). This substance was found to have the empirical formula $C_{14}H_{17}O_7N$, and on hydrolysis with hot dilute hydrochloric acid of the enzyme emulsin, yielded one molecule each of prussic acid, parahydroxybenzaldehyde, and dextrose.

Sorghum halepense, Pers. (*Andropogon halepensis*) is considered by Hackel to be a variety of S. vulgare, Pers. (*Andropogon sorghum*), and there is little doubt that "dhurrin" is found in it as well as in the typical plant. The free prussic acid is the actual substance which causes the death of animals eating the young vegetative parts of sorghum.

The enzyme emulsin is present in the parts of the plant containing the glucoside, and when in the early processes of digestion the two come together, the emulsin, by the addition of water to the "dhurrin," breaks the latter down and liberates the poisonous prussic acid.

An examination of the numerous records of cases in which sorghum was used for fodder establishes two facts of practical importance.

Firstly, the young vegetative parts of the plant are the most dangerous to stock, the mature plant being nearly or quite harmless. Analyses of old plants have shown that little or no prussic acid yielding substance was present.

Secondly, the poisonous effect of the grass is enhanced in times of drought. One writer states that the grass is dangerous only in the green state, and that if the same grass is cut and dried and used as fodder, it has no injurious effect. This may be due to the destruction of the glucoside or the emulsin, or both, by the drying of the grass without their coming into contact with each other, but it is possible that the grass was not cut till near maturity—that is to say, after the disappearance of the prussic acid yielding glucoside.

APPLE CULTURE IN VICTORIA.

(*Continued from page* 589.)

By J. Farrell, Orchard Supervisor.

Growth Made by One-year-old and Two-year-old Trees Compared.

It has been previously stated that the planting out of yearling whip-growths is advocated. When planted out at one year old, the tree has the advantage of being allowed to establish its root system early in life, and its development is not impeded by further removal. When the original roots are pruned prior to planting, and the tree cut back to the desired height subsequently, the newly formed root system is able to produce and maintain the three leaders sent up from the crown. But the two-year-old tree, when similarly treated at time of planting, is rarely able to produce and sustain the number of new growths desired for leaders. Whereas, if planted out one year sooner, the tree would have thoroughly established its roots, and, owing to its extended feeding area, the vigorous growths required would be obtained.

Plate 26, Fig. 1, is a John Sharp apple, and a typical yearling of this variety. Fig. 2 is a Prince Alfred, two years old. The latter, when first pruned, was cut into the strong ripe yearling wood. This enabled the leaders to strike off at a nice angle, and is a much better method of forming the head than the one of making it prematurely by cutting the young, soft wood, as explained in connexion with Plate 20, Figs. 2 and 3. Figs. 3 and 4 are same trees, which were grown together in the nursery row, and pruned as shown before being planted out in a fairly rich dark sandy loam. During the period of growth they received similar treatment.

Plate 27 shows the roots and branches made by same trees during the period of growth. The roots and branches of Fig. 1 are strong and well balanced, but the John Sharp usually responds well under fair treatment. Although Fig. 2 made more roots than Fig. 1, it did not produce as much wood on top. Prince Alfred is usually a vigorous grower, and it is probable that if this tree were planted out when one year old it would now have a much more extensive branch system.

Plate 28 illustrates the same trees, the leaders of which are pruned to the buds suitable for the production of the growths desired for next season. In the case of Fig. 1, the side buds are so placed as to permit of the leaders being cut about 6 inches from the crown. While, when Fig. 2 had advanced to the same stage, the buds, at which the cuts are made in order to produce leaders in suitable positions, were not so conveniently placed. This necessitated rather long cutting of the leaders, about 8 inches from their base.

Top-grafted Trees.

A top-grafted tree, as explained in connexion with Plate 17, Fig. 1, consists of a scion of yearling wood of the desired variety, and containing three or four buds, according to the number of main arms, on which it is intended to construct the framework of the tree, grafted on to the stock, about 9 inches from the ground.

In the case of Plate 29, Fig. 1, the scion is Jonathan on a two-year-old Northern Spy stock. The scion originally contained four buds, and

each produced a leader. The uppermost one grew vertical and too strong in proportion to the others, thus forming an objectionable centre.

It was originally intended to start the branch system of this tree on four main arms, but, in order to develop a tree with an open centre and on modern commercial lines, three leaders only are retained, as the removal of the objectionable one became imperative.

Fig. 2 shows the result of this treatment. The leaders retained are not equal in strength, but in this respect greater uniformity could have been maintained had the terminal buds on the stronger growths been treated as explained in connexion with Plate 22.

Plate 30, Fig. 1, is also Jonathan, and worked similarly to the previous

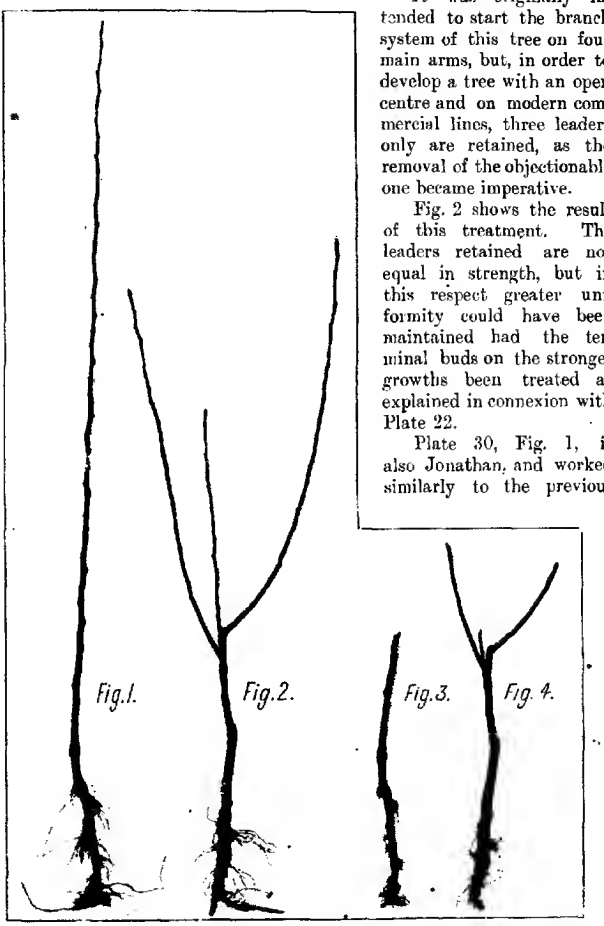


Plate 26.—Roots and Branches of Young Trees Unpruned and Pruned.

tree. But in this case, as occasionally happens when strong stocks are employed, four leaders, of uniform strength and radiating at a suitable angle from the crown, were produced.

Fig. 2 is the same tree pruned. Its four leaders are retained, but they are cut rather long, to side buds, about 8 inches from the crown, on account of suitable ones not having been produced lower down the leaders.

Method of Planting.

The trees should be planted out as soon as possible after the planting season commences, in June. It may be observed that when the trees are lifted early from the nursery, and heeled in, they frequently produce

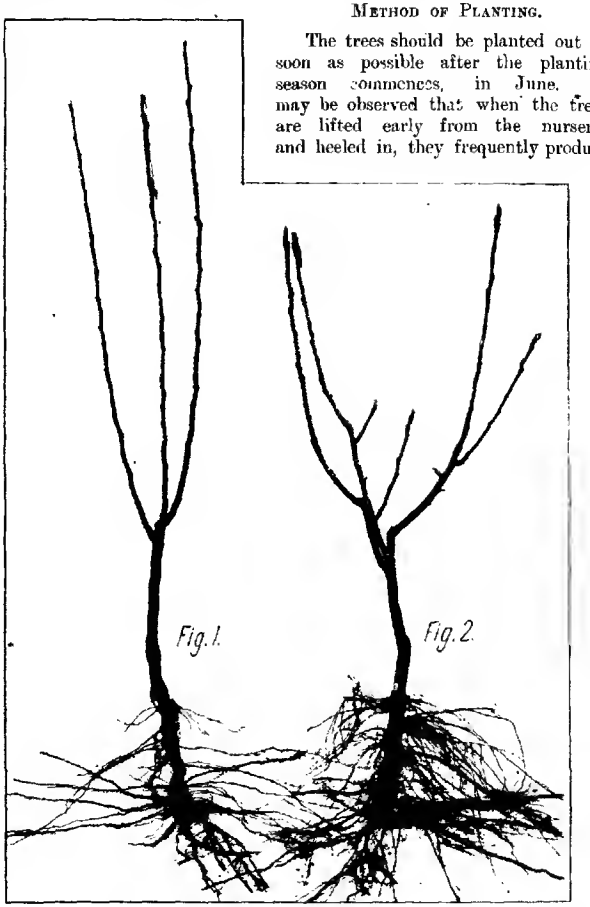


Plate 27.—Same two Trees showing One Year's Growth and Branches.

a number of fibrous roots, which are afterwards destroyed when the trees are being further removed and during transmission to the planter. When early planting is adopted, and the fibrous roots, pro-

duced during the dormant period, allowed to remain intact, the result, other conditions being favorable, will be an early and prolific growth during the following vegetative period. At planting time the roots are cut back, usually from about 4 to 6 inches long. But, when harder pruning is not adopted, all the fibrous roots produced from the nodes on the scion of the stock should be removed, and particularly in the case of the Northern Spy stocks. A stronger and more evenly balanced root system is invariably the result of such treatment.

By employing square stakes to mark out the positions of the trees and to subsequently support them until such time as their roots are

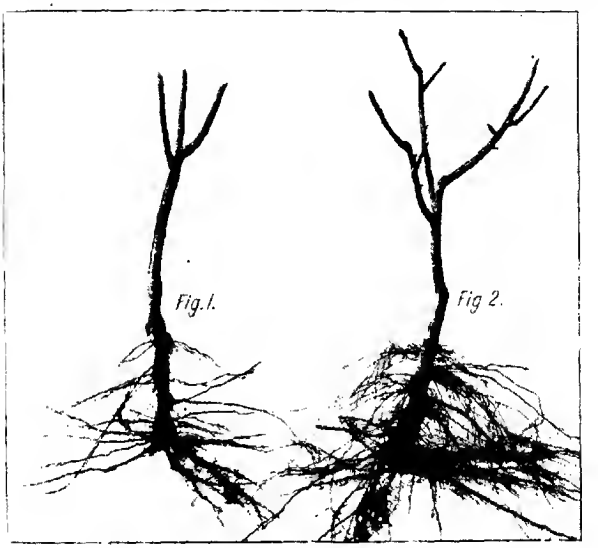


Plate 28.—Same Trees, showing where Leaders should again be Pruned.

thoroughly established, their uprightness and future stability is insured. The trees should be planted close to the stakes, to which they should be firmly tied, as shown in Plate 15, Fig. 1.

Use of the Planting Board.

The use of the planting board is recommended when trees are being planted without stakes to support them and where round pegs are employed to mark their positions. Plate 31 depicts this, which is not only the simplest and quickest means, but also the most accurate method of obtaining straight rows of trees.

Fig. 1 is a view of the planting board, which is 6 feet long and made from 6-in. by 1-in. flooring, with a notch in the centre, and two holes

for iron pegs, each about 18 inches long. The holes should be of sufficient diameter to permit of the pegs passing freely through them when placed as shown in the section, Fig. 2.

To plant the tree, bring the notch in the board against the marking peg, and drive in the iron pegs. Then lift out the board, remove the marking peg, and dig the hole to receive the tree. Next, slip the board over the pegs into its former position. When the tree is placed in the hole it should be held upright, with its stem in the notch of the planting board, and to the same depth at which it grew in the nursery row. When the earth has been carefully

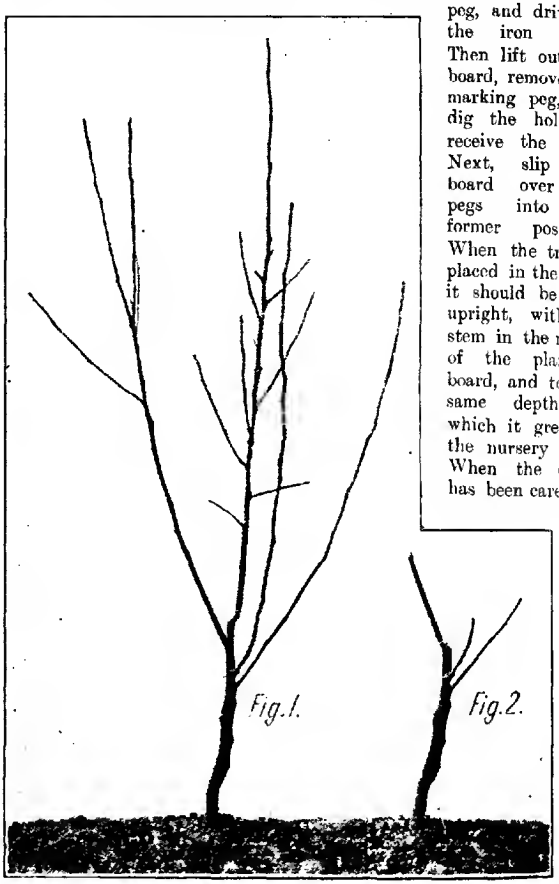


Plate 29.—Jonathan Unpruned and Pruned.

filled in around the roots, press it firmly with the foot to exclude the air and give the tree a firm hold. When this work is carefully executed the tree occupies the exact position marked out for it by the peg.

In planting small trees the removal of the planting board, to permit of the holes being dug, may be obviated by employing two 2-in. cleats, as shown. By this means the board is raised 2 inches above the surface level, when the holes may be dug and the trees planted without hindrance.

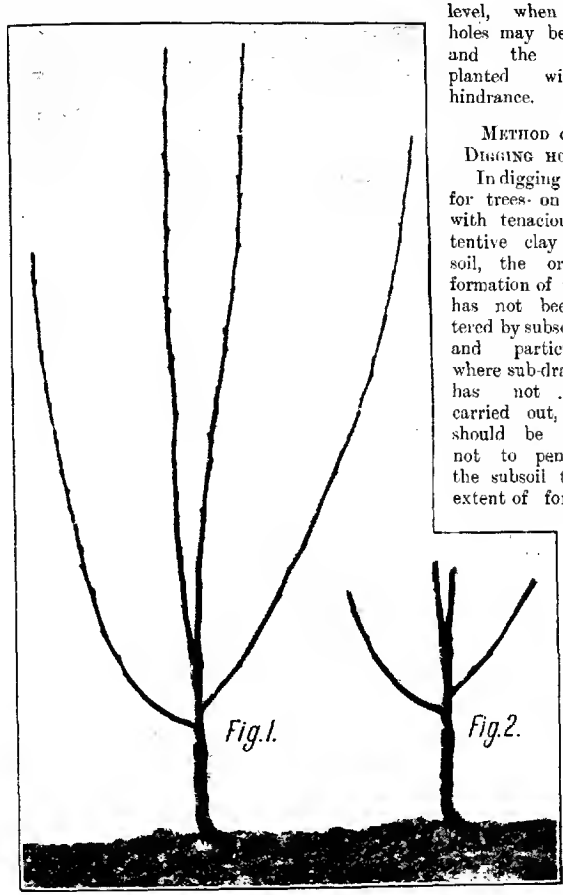


Plate 30.—Jonathan with Four Leaders Unpruned and Pruned.

METHOD OF DIGGING HOLES.

In digging holes for trees on land with tenacious retentive clay subsoil, the original formation of which has not been altered by subsoiling, and particularly where sub-drainage has not been carried out, care should be taken not to penetrate the subsoil to the extent of forming a pan or water catchment, as shown in Plate 32, Fig. 1. When a tree is placed in a hole of this kind, and more especially if it be planted too deep, the surplus water in the soil, as indicated by the arrows, drains into the hole and lodges there, creating unfavorable conditions from which trees frequently suffer and often die.

Fig. 2 shows the correct method of planting. When the roots take up this position in relation to the subsoil, a free passage of the water from the root area to the sub-drains, which should be employed in all orchard land of the class mentioned, is provided.

The evil effects of water lodgment, which causes sourness of the subsoil in which the lower roots feed, will be more fully dealt with later on, when the necessity for orchard drainage generally, and all the conditions which govern same, are being explained.

When the hole is being excavated, it should be made with sufficient diameter to permit of the roots, if lightly pruned, taking up their natural positions. When the hole is too narrow the roots cannot be properly extended when planting, and a tree started to grow under these conditions cannot thrive as well as when proper planting methods are observed.

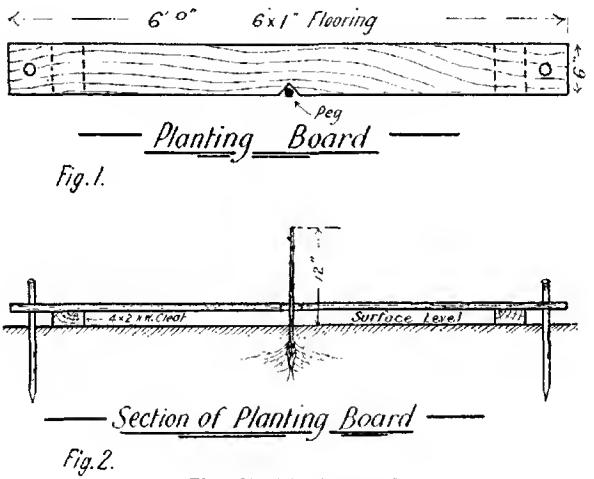


Plate 31.—Planting Board.

Establishing the Branch System.

There is no phase of orchard management that requires more scientific knowledge on the part of the fruit-grower, in order to obtain the best results from his orchard, than the establishment and control of the branch systems of his trees by pruning on modern and commercial lines. Under the ancient method, the variety grown, whether budded or grafted on to the root-grafted stock, layer, sucker, or raised from a seedling, was encouraged when planted out in the orchard to develop into what was known as a standard tree. This was done by permitting the centre growth to run to the vertical, and by the removal of the side-shoots to a height of about 6 feet from the ground. From this point the centre leader continued its upright growth, and, in accordance with Nature's method, it threw out side arms which eventually culminated in a conical

head. Then the apple-grower began to cut the stems about 6 feet from the ground, in order to divide up the centre leader into three or more main arms, which radiated from the crown at an open angle to the vertical. This, in point of time, is recognised as the line of demarcation which separates the ancient method from the commencement of scientific pruning.

The three or more main arms produced on the stem by cutting in the manner described were still further multiplied by subsequent yearly prunings until a head of the requisite dimensions was obtained

The tree, with its increased number of leaders, which constituted a broader framework as a result of this treatment, had also a corresponding increase in the number of lateral growths. These were of a better quality and of higher fruit-bearing capacity than those previously obtainable.

When it was observed that the judicious manipulation of the leaders produced the desired effect, consideration was next given to the fruiting lateral growths. The stronger and less fruitful of these were removed,

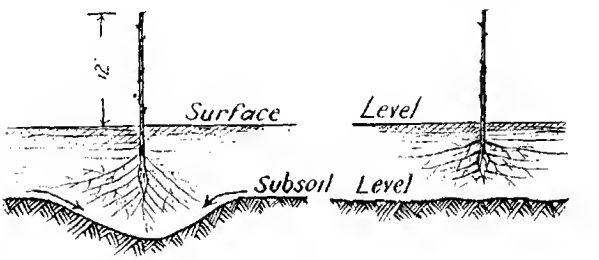


Fig. 1. *Fig. 2.*

Plate 32.—Digging Holes for Trees.

while the weaker and more fruitful ones were shortened back to encourage the development of stronger blossom buds.

The next step in the advancement of scientific pruning was the gradual shortening of the stem of the standard tree until, during recent years, it has become only about 12 inches high. This is practically regarded as the present-day standard.

Science has so far advanced in regard to modern pruning methods that it has evolved and established set principles under which the leader, lateral, and spur growths of the different varieties may be treated according to their individual needs.

Owing to the application of scientific principles in pruning, supplemented by good cultivation, spraying, &c., fruit-growers are now able to regulate the quantity, size, and quality of their fruit to meet modern requirements, both at home and oversea. And, when given reasonable marketing facilities, they are enabled to make fruit growing a commercial success.

Plate 33 shows a tree of the old English standard type. It is an unnamed seedling, nine years old, and the lowest branch on the stem

is nearly 6 feet from the ground. In the Homeland, generally speaking, apple growing is carried on mostly as an adjunct to mixed farming. The trees, as a rule, are planted in grazing paddocks, and protected until their branches have grown out of the reach of stock. They are rarely pruned, but, owing to suitable soil and favorable climatic conditions, heavy crops of good fruit are frequently harvested.

Plate 33.—An Unnamed Seedling of Ancient Type.

Failure, however, has invariably attended any attempts which were made in Victoria to emulate the Old Country methods of apple culture.

Our soils, particularly those in the northern and warmer districts, part too freely with their moisture during dry weather, thus rendering cultivation essential to the growth and maintenance of healthy, vigorous trees, and from those only can we obtain remunerative crops of fruit.

Plate 34 is a Rome Beauty tree of modern design. Its stem is 15 inches high, and the branch system, with its open centre, represents in shape an inverted cone, as compared with the full-centred and conical formation of the ancient type. And when further compared with Plate 33 it will be observed that, in consequence of the hard pruning to which the Rome Beauty was subjected during the first four years of its growth, a circle of leaders was produced, each representing a longitudinal section in the tree's geometrical make-up. This treatment has practically revolutionized the apple tree formation of olden times.

Plate 34.—A Rome Beauty of Modern Design.

The reason for selecting the Rome Beauty to show the comparison is because it is one of those most difficult to shape into the modern type.

The habit of this variety, like the Statesman and others, is to send up strong vertical leaders, particularly when the land is rich or manure applied generously. Many of its leaders produce weak or dormant buds, and they are consequently barren of fruit-producing laterals. This necessitates careful selection and judicious pruning of the leaders in order to secure a sufficient number of short, fruitful laterals. The laterals also require scientific pruning treatment, but this matter will

be more fully detailed later, when the pruning of the Rome Beauty comes under review.

Much has been done in Victoria in the way of experimental pruning, spraying, cultivation, drainage, irrigation, interpollination, &c., but there is no doubt the further application of science to the different phases of the fruit-growing industry would have a stimulating effect, which would assist it to maintain its position as one of our chief national assets.

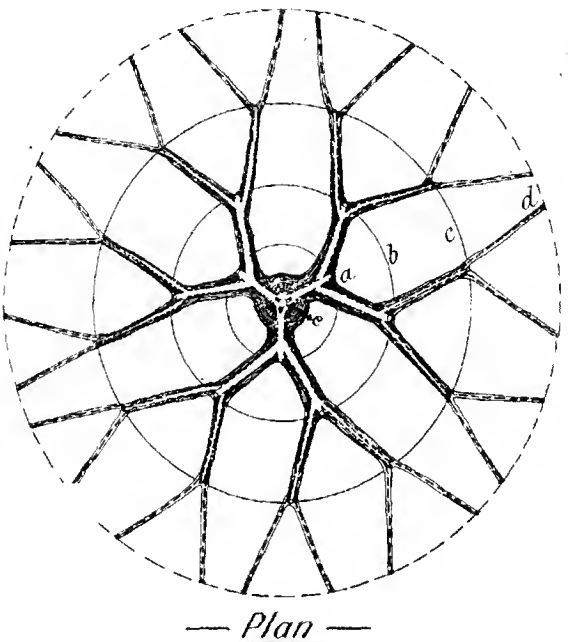


Plate 35.—Plan of the Modern Type of Tree.

Plans of the Branch System.

Plate 35 is plan of the branch system of the modern type of tree as viewed from the vertical. The centre (e) shows where the yearling whip-growth is cut the first year after being planted. The three buds shown send out shoots which, when cut to about 6 inches long the following year at the points inscribed by circle (a), form the main arms on which the branch system is constructed. Straight lines, drawn from point to point of the main arms describing the 120-degree angles within the circle (a), would represent an equilateral triangle.

When the resultant shoots from the (a) cut are pruned again the following year at (b), twelve leaders will be obtained. The number may be increased to twenty-four by cutting at (c) the succeeeding year. When the requisite number of leaders are obtained, the (d) cut should be made to an outward or inward bud, according to the angle to the vertical desired. Or the cut may be made to a bud on either side, in order to regulate the leader spacing.

Plate 36 gives side elevation of the tree. One leader is retained to show its angle to the vertical and the lateral growths.

Generally speaking, the angle of 40 degrees from the vertical is a suitable one for the leaders. But it is often the experience of pruners to find great difficulty in producing an open centre when dealing with

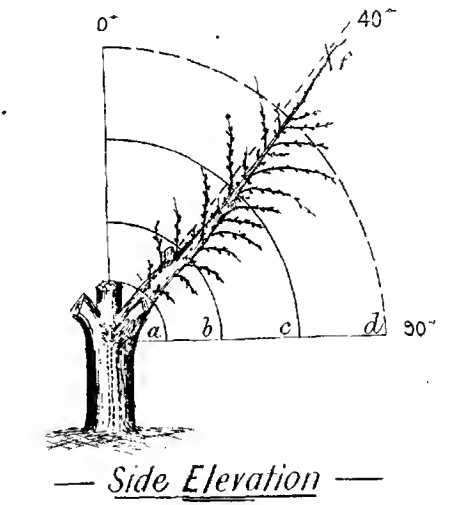


Plate 36.—Side Elevation of Modern Type of Tree.

strong trees with upright habit of growth. When pruning the weaker-growing varieties, the leaders should be kept somewhat more erect, because, when trees of this class bear heavy crops of fruit, the branches bend down, and when relieved of the fruit they are rarely able to regain their previous positions.

The four increasing quarter circles represent the corresponding quadrants in Plate 35, but they are drawn from the vertical to the horizontal to show the side elevation. It will be seen that progressive leader duplication results from the cutting at (a), (b), and (c), respectively. But when cut at (d), the single leader is maintained. Should the leader incline below the desired angle, in this case 40 degrees, it may be raised by cutting to the inner bud (f). But when the leader is

above the proper angle it may be directed into position by being pruned to the outer bud immediately below the (f) cut.

Plate 37 shows enlargement of circle (a) and the centre portion of Plate 35. The centre part is the section of yearling whip-growth cut to three buds, which produce the main arms of the tree. The three lines radiating from the buds represent the positions of the main arms when

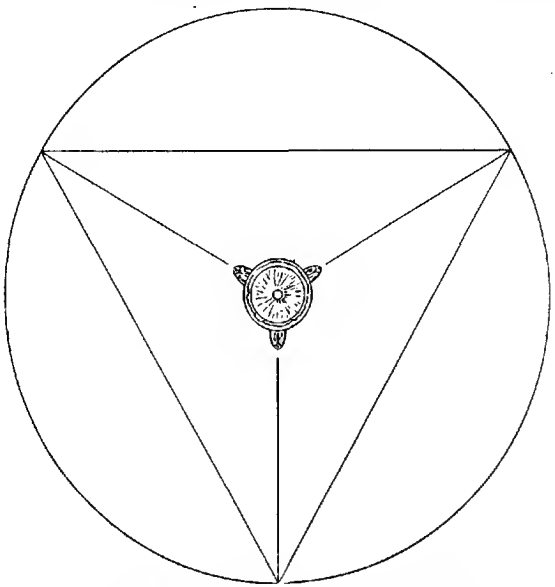


Plate 37.—Establishing the Tree on the Equilateral Triangle Principle.

produced. The circle indicates the points, about 6 inches from the crown, at which they should be pruned when the tree is two years old. Lines drawn as shown, from point to point of the main arms when cut, describe an equilateral triangle, which is divided by the main arms into three equi-angular figures.

(To be continued.)

MINERAL matter, or, as we term it, ash, goes to build up the framework, the bone of the animal, and to furnish the small amount of mineral matter (lime, phosphoric acid, &c.) which is found in the various tissues of the body. There is always a sufficiency of ash in the home-grown fodders to supply the needs of the animals.

CURING BACON.

A good method of curing bacon is the following:—The side is cut into three pieces—ham, flitch, and shoulder. The rind of each is well rubbed with fine, dry salt, the pieces being then placed on a stone slab or in a shallow water-tight wooden box, and sprinkled with salt. The curing of the flitch is effected by (1) applying a thin covering of salt; (2) a slight sprinkling of saltpetre; (3) a sprinkling of granulated sugar (a single handful); and (4) a final sprinkling of salt. The flitch is then left for four days, when the rind is again rubbed with salt, a very thin layer of which is also sprinkled over the surface.

In eight to ten days from the commencement of curing the salt is brushed from the flitch, which is then hung up to dry for ten to fourteen days, and finally covered with fine muslin and stored in a cool, dry room. The ham and shoulder are treated in the same way as the flitch, but are left "in salt" fourteen to twenty-one days, and sprinkled with salt at intervals of four or five days. The ham, especially, should be disturbed as little as possible. From a carcass weighing 280 lbs. the approximate amounts required are:—Fine, dry salt, 20 lbs. to 24 lbs.; saltpetre, 1 lb. to 1½ lbs.; sugar, 2½ lbs. to 3 lbs.

To smoke bacon after it is cured it is placed in water just warm enough to bear one's hands in it, and is then brushed over, which removes all fat, sugar, or slime from the surface. It is then placed in a tank or vat, and covered with clean cold water, in which it is allowed to remain for from 18 to 24 hours. This takes a lot of the salt out, and renders it a mild-cured bacon. The bacon is next hung up in a well-ventilated room to dry. If the weather is favorable, the days being fine and dry, with a slight breeze of wind during the greater part of the time, the bacon is generally sufficiently dry in from six to seven days.

In trimming the bacon, the sharp points of the rib bones are sawn off, and the remaining part of the foreleg also sawn off level with the shoulder. The knife is then run over the belly part of the rib bones, and any loose pieces removed. The sweat skin is scraped off with a sharp knife, and the side is then rubbed over with a little olive oil, which gives it a nice glossy appearance. The bacon is then placed in the smokehouse. The best smokehouse is where the fireplace is outside the smokehouse, and the smoke is conveyed through a flue to the interior. This allows of the bacon being smoked in a cool state, which is, of course, a great advantage. From four to five days' smoking is given, care being taken not to smoke too much, as this greatly affects the flavour.

—*Auckland Weekly News.*

The application of lime in moderate quantities to the soil assists the beneficial processes always going on in fertile soils, due to the action of bacteria, thus helping the conversion of ammonia and other compounds containing nitrogen derived from decaying organic matter and nitrogenous fertilisers into nitrates, the form in which plants mainly, if not entirely, utilize nitrogen.

COMPARATIVE FOOD VALUES OF DAIRY PRODUCE.

By R. T. Archer, Senior Dairy Inspector.

Food is necessary to all organisms for their development and growth, to supply them with heat and energy, to make good the losses resulting from wear and tear of their mechanism, and to keep them in a state of efficiency.

The elements of all our animal and vegetable foods are derived from the inorganic earth, air, and water. It is obvious that animals could not live upon inorganic substances or derive nutriment from them, important as such inorganic materials are for many vital processes. The essential parts of animal structures are derived from previously organized materials. Most of these organic compounds arise in the vegetable kingdom as comparatively simple substances, and become elaborated into more complex bodies in the vegetable or animal organism. Therefore, it may be said that the constituents of human food, the elements of the human body are derived from the denizens of the earth, air, and water.

The materials which compose the structures of the man's body are derived from his food, and are in turn composed of inorganic substances to which they can be reduced. The most important of these elements are carbon, hydrogen, oxygen, and nitrogen, which form twenty-nine thirtieths of the entire weight of the body and enter into the construction of every cell. There are other elements which, even though they form but a small portion of the weight of the body, are of prime importance to the proper construction of the various parts of the body, *e.g.*, iron for the blood, phosphorus for brain and nerves.

The value of a food is estimated by the amount of heat (which is the equivalent of energy) that is generated by a given quantity when oxidized or burnt or consumed, which amounts to the same thing. This is expressed in heat units or calories. A caloric is the amount of heat required to raise a kilogram of water 1° Centigrade or 1 lb. of water 4° Fahrenheit.

The purpose for which food is required in the body is—

1. To build up the body tissue.
2. To develop heat and energy.
3. To repair the waste of tissue.

The principal kinds of nutritive ingredients are protein, fat, carbohydrates, and mineral matter or ash.

There are also present in most kinds of food, water, indigestible fibre, &c., which are called non-nutriments. In comparing the values of different food materials for nourishment, they are left out of account.

The digestible nutrients are divided into four principal classes as follows:—

Protein, e.g., albumen (white of eggs and milk), casein (curd) of milk; muscle (lean meat); gluten of wheat, &c. These are so called nitrogenous foods. Their particular function is to build up the cell system and repair waste of tissue. They will also produce fat and will generate heat or energy.

Fats, e.g., fat of meat; fat (butter) of milk; olive oil, &c. These form fatty tissue, not muscle, and generate heat and energy.

Carbohydrates, e.g., sugar, starch, cellulose (woody fibre), &c. These are converted into fat, and serve as fuel also.

Mineral matter or ash, e.g., phosphate of lime, iron, sulphur, salt, &c. These form the skeleton, &c.

Milk.

Milk is an article of diet whose sole function in nature is to serve as food.

The importance of the milk industry to the community is much greater than its money value (as compared with other industries) would imply. It is probable that the quality of the milk supply bears a closer relation to the public health than does that of any other food. This is partly because of the exceptional nutritive qualities of milk and the prominent part which it plays in the diet of children and others to whom the quality of the food is of special importance, and partly because the fluidity and opacity of milk offer unusual opportunity for adulteration; and the fact that bacteria readily grow and multiply in it makes it especially important that the milk be carefully guarded from contamination. It is, therefore, important that the milk industry be controlled with all possible care both as regards the nutritive and the sanitary qualities of the product.

The qualitative composition has been concisely stated by Richmond as follows:—

> "It is essentially an aqueous solution of milk-sugar, albumin, and certain salts, holding in suspension globules of fat, and in a state of semisolution, casein, together with mineral matter. Small quantities of other substances are also found."

The quantitative composition varies considerably with the different breeds of cattle, period of lactation, &c.

The average composition of cow's milk may be taken as follows:—

Fat	4.0%
Protein	3.3%
Carbo-hydrates	5.0%
Ash	0.7%
Total solids	13.0%
Solids not fat	9.0%
Water	87.0%

Usual limits of variation—

Fat	3.0% to 6.0%
Protein	3.0% to 4.0%
Carbo-hydrates	4.6% to 5.0%
Ash	0.70% to 0.78%
Solids not fat	8.5% to 9.5%

Milk sugar and ash vary very little. Proteins usually constitute about one-fourth the total solids.

The economical position of milk may be gauged when it is borne in mind that one quart of milk is equal to 1 lb. of steak or to eight or nine eggs (that is, when the full fuel value is allowed to the steak, *i.e.*, 960 calories per lb., whereas, after the usual loss of fat in preparation and cooking the steak, only about 640 calories remain); but, from the point of view of its digestibility, milk has a great advantage over other foods, largely due to the nature of its constituents. The carbo-hydrates (lactose or milk sugar) are already in solution, and ready to be acted upon by the digestive juices of the intestines, and are less susceptible

to fermentation and less liable to irritate the stomach. The fat is already emulsified and more readily available to the body than the fat of other foods except eggs.

The proteins of milk are of high nutritive value. When milk is taken under normal conditions (even in relatively large quantity and in connexion with only a small amount of bread or other solid food) about 97 to 98 per cent. of milk protein is absorbed. Numerous recent digestive and metabolic experiments indicate that under normal conditions it is as completely digested and absorbed as any of the food proteins, and has the advantage of not containing the substances which yield uric acid in the body, nor of being readily susceptible to intestinal putrefaction. Not only do the milk proteins show a high coefficient of digestibility, but metabolic experiments and clinical observations show that milk furnishes a form of protein food particularly adapted to bring about a storage of protein in the body. This is considered due in part to the fact that casein contains phosphorus as an essential constituent. The ash constituents of milk are important, not only for their property of being adequate in the absence of all other ash constituents, but also in their bearing upon the adequacy of the phosphorus, calcium, and iron supply in a mixed diet. Phosphorus compounds are present in milk in relative abundance and in a variety of forms. Calcium is present in still greater proportion. Milk contains slightly more calcium, volume for volume, than does limewater. Iron is present in milk in only small quantities, but evidently in a form exceptionally favorable for assimilation, as a diet of milk and white bread appears to be adequate for the maintenance of iron equilibrium in man, whereas white bread alone in larger quantity on a diet of bread, and iron-free protein is much less efficient.

Furthermore, as the late Dr. A. C. H. Rothera explained, milk contains substances other than fats, proteins, carbo-hydrates, and salts, which perform important nutritive functions, especially in relation to growth.

Taking into consideration the many and important factors which increase the value of milk as food above that indicated by its mere proximate composition and fuel value, and also the fact that it requires no preparation and has no waste, it is believed to be true economy to make liberal use of milk in the diet so long as the milk does not cost more than twice as much in proportion to the energy it furnishes as the average food eaten. On this basis, families who must live on as little as 8d. to 10d. per person per day for food may wisely use reasonable quantities of milk at 5d. per quart, balancing this by a larger use of such food as bread, which furnishes energy much more cheaply than the average food of the diet. Especially in the feeding of children should milk be used freely, because of its many advantages as a "tissue builder" and "growth promoting" food. The vitamines which Dr. Rothera spoke about are found in milk, butter, eggs, and cod liver oil, but not in lard, cottonseed oil, or olive oil.

Cheese.

A pound of cheese represents the casein and fat of a gallon of average milk. Cheese is thus a concentrated and economical food, especially when compared with other foods of animal origin. Generally speaking, cheese sells at no higher price per lb. than the ordinary cuts of meat, while it is considerably richer in both proteins and fats.

Cheese is very rich not only in proteins and fats, but also in calcium and phosphorus, since these elements in milk are largely in combination in or with the casein, and so concentrated with the casein in the process of cheese-making. The iron protein compounds of the milk are also retained in the cheese.

Digestibility.—Cheese should be looked upon as a food and given a rational place in a meal, and when thoroughly masticated is usually well digested. It should not be eaten at the end of a sufficient meal. The result of a large number of digestive experiments goes to prove that about 95 per cent. of the protein and over 95 per cent. of the fat of the cheese were digested and absorbed. The amount of cheese eaten by the men in the experiments, which were conducted by the Department of Agriculture, U.S.A., was from ⅓ lb. to ½ lb. each per day.

Langworthy and Hunt sum up the position as follows:—

"Experiments have shown that when eaten either raw or carefully cooked, cheese is as thoroughly digested as other staple foods, and is not likely to produce physiological disturbance. The fact that cheese, like meat, contains neither starch nor cellulose suggests that, like meat, it should be combined with bread, potatoes, and other starchy foods, with vegetables and sweets. The concentrated character of cheese and many cheese dishes suggests the use of succulent fruits and vegetables with them. The high percentage of fat in cheese suggests the use of correspondingly small amounts of fat in the accompanying dishes, while the soft texture of cheese dishes as compared with meat makes it reasonable to serve the harder and crustier breads with them. Though cheese is so generally used in some way in most families, yet the making of menus with cheese as a central dish is less well understood than more usual food combinations, since there is less experience to serve as a guide.

In order that the diet may remain well balanced, cheese, if used in quantity, should replace foods of similar composition rather than supplement them. This means that the housekeeper, in suitable ways, can use cheese, meat, fish, eggs, and other foods of similar composition as substitutes for one another, being governed by their relative market value at different times and seasons, by the tastes of her family and similar considerations. If she uses the different foodstuffs with reference to their nutritive value, and is skilful in preparing foods in appetising ways and in serving them in attractive combinations, the daily fare may be both adequate and pleasing, whether she selects cheese or meat or eggs or fish, or other foods to supply the nitrogenous material and fat. The only warning necessary is that overripe cheese may contain a considerable percentage of ammonia.

As the food value and digestibility of cheese becomes better known, it should come to occupy a much more prominent place in the dietary than it does at present. In England it is one of the staple foods, and consumed in large quantities, especially by men who do much heavy manual work.

The average composition of cheddar cheese is—Water, 35 per cent., fat, 34 per cent., protein, 25 per cent., salt, milk-sugar, lactic acid, and ash, 6 per cent.

The fat of cheese is in a finely-divided state, and should be quite uniformly distributed throughout the cheese mass. Chemically it has

the composition of milk, fat, or butter fat, and shows but little change as the result of the ripening process.

Protein of cheese consists chiefly of more or less digested casein (though to a small extent albumin also) of the milk. During the ripening process much of the casein is digested into a soluble protein and other compounds.

The ash of cheese is always high in calcium, phosphorus, and sulphur, and fairly high in iron, these elements of the milk being largely constituents of the curd; while the potassium, sodium, and chlorine of the milk are largely removed in the whey, but the sodium and chlorine are later more or less restored in added salt.

Butter.

Butter is the clean, non-rancid product made by gathering in any manner the fat of fresh or ripened cream into a mass, which also contains a small portion of the other milk constituents with or without salt, and contains not less than 82 per cent. of milk fat. Fuel value of butter containing 85 per cent. fat is equal to about 3,500 calories per lb.—84 per cent. fat represents 3,450 calories per lb.; 82 per cent. fat represents 3,370 calories per lb.

A lb. of butter is equal in energy value to 5 quarts of milk; but, in view of the proteins and ash constituents which the milk contains, it would probably be wise to consider that 3 quarts of milk fully equal to 1 lb. of butter as a food, except perhaps in those cases in which the energy problem distinctly predominates.

If any considerable number of consumers should decide to buy less butter and more milk, the diminished demand for butter and increased demand for milk would result in bringing to market some of the milk now used for butter-making. This would not appreciably disturb agricultural conditions, and would plainly tend towards a better conservation of resources for the community as a whole, because, under present conditions, the separator milk is not generally utilized to the best advantage. Economically, therefore, the making of butter should for the most part be carried on in regions which are adapted to dairy-farming, but too remote from cities and towns to send their milk to market, or in districts in which it is feasible to make good use of the separator milk. Year by year we see the city purveyors of milk going further afield for their supplies, and the country butter factories may well co-operate in this class of trade, which, as it becomes better organized, should be the means of improving the quality of milk brought to the city.

Value of Food Purchasable for 1s. at different Market Rates.

	Calories.
Butter at 1s. 6d. per lb.—1s. would purchase	2,550
Cheese at 1s. per lb.—1s. would purchase	3,490
Milk at 5d. per quart—1s. would purchase	2,020
Pork (fresh) at 8d. per lb.—1s. would purchase ..	2,852
Ham (smoked) at 8d. per lb.—1s. would purchase ..	2,799
Shoulder of mutton at 10d. per lb.—1s. would purchase ..	1,212
Leg of mutton at 1s. per lb.—1s. would purchase ..	917
Loin of mutton at 1s. per lb.—1s. would purchase ..	1,407
Beef (round) at 9d. per lb.—1s. would purchase ..	1,133
Beef (loin) at 11d. per lb.—1s. would purchase ..	1,076
Beef (rump) at 9d. per lb.—1s. would purchase ..	2,064
Potatoes at 6s. 6d. per cwt.—1s. would purchase ..	1,176
Wheat bread at 8d. per 4-lb. loaf—1s. would purchase ..	7,680

NOTES ON PORTUGUESE VINE VARIETIES.

By F. de Castella, Government Viticulturist.

(Continued from page 628.)

Souzão, Cornifesto, Mourisco Preto, and Donzellinho Do Castello.

The four varieties which form the subject of the present article, though not so pronounced in their characters (excepting perhaps Souzao) as Alvarelhão, Bastardo, and Touriga, which have already been described, are nevertheless standard sorts of the port wine region, and, as such, deserve detailed mention.

Souzão and Cornifesto belong to the Touriga type, since they produce wine of deep colour, for which reason they may prove of value in Victoria for the production of full-bodied dry red wines, as well as for communicating colour to wines of Port type. Souzão is especially interesting on account of its remarkable richness in colour.

Mourisco Preto and Donzellinho belong more to the Bastardo type, producing delicate aromatic wines of light colour; of the two Mourisco seems to be the sort of most promise in Northern Victoria, where it should yield excellent sweet wine. Curiously enough, it is also a very fair table grape.

Souzão.

Synonyms: VINHÃO, TINTO DO MINHO, ETC.

One of the most striking port wine grapes is undoubtedly Souzao, which may be considered to belong to the Touriga type on account of its remarkably high colour, though in other respects it is distinctly inferior to it in quality. Souzão was introduced into the Douro district over a hundred years ago, when the demand set in for ports of higher colour, and it is mainly the truly extraordinary amount of colouring matter it contains which renders it interesting.

Curiously enough, this grape is also remarkable for its high acidity, a fact which may render it of value in Northern Victoria, especially in dry seasons, when deficient acidity often requires correction. It is quite possible that Souzão may prove of more value in Australia for increasing the colour and correcting deficient acidity of dry wines than for the making of sweet wines of Port type. It may even prove of more value as regards colour than Alicante Bouschet, than which it certainly contains much more acid.

As to the exact way in which the colour is contained—whether in the skins alone or in both skins and pulp—there is a curious disagreement between some of the best known Portuguese authorities, as will be seen presently; the explanation is probably to be found in the statement by Sr. Cincinnato da Costa that there are two sub-varieties of this vine.

Rebello da Fonseca (1791) says of it:—

> The English merchants who export the greater part of our wines give preference to those which are highly coloured. This led to the introduction into the Alto Douro of those varieties of grapes capable of giving to the wine the very darkest natural colour. Barnahé Velloso Barreto de Miranda, provedor* of the Douro Wine Company, and Dr. Pantaleão da Cunha Faria introduced plants of Souzão from the province of Minho, where there is much of it, and propagated

* Inspector-General of the celebrated *Companhia general das vinhas do Alto Douro*, created by the Marques de Pombal, with many privileges.

it largely in their vineyards, by this means arriving at obtaining very full wine (*muito cobertos*), and at the same time of a bright ruby colour; from these vineyards it spread throughout the Douro, and in reality it is the dark sort which should be preferred, because, besides colour, it has sweetness and flavour.

This and *Tinta da França* are the only grapes which have red juice; they should, therefore, convey the most durable colour to the wine.

Fig. 10.—Bunches of Souzão Grapes.
Reproduced from *O Portugal Vitícola*, reduced to about half natural size.

I have extensively propagated Souzão in my properties, but have not yet been able to make wine separately from it in large quantities. In 1787 I had the grapes of this vine gathered separately, making with it three *almudes* (16½ gallons) of wine. After stemming, I again crushed the berries in a tub, where it was left to ferment, and as soon as the wine was made it was racked into a cask, the skins being pressed by hand. . . . I next had the skins washed with a

equal quantity of light-coloured wine, which became as dark as the first. I repeated the operation with a like quantity of wine, which also took a dark colour. Noting this, I ordered that all the wine be racked, together with the skins, into one cask holding about nine pipes (over 900 gallons), filling up with wine of very light colour, which was still fermenting. After it became clear, the wine of this cask was the darkest I had that year, with a very bright colour.

Antonio Gyrao writes at considerable length concerning Souzão:—

Its berries have a very particular structure, because in reality each berry is composed of two concentric layers—an exterior one, consisting of a hard skin, pulpy within, and much charged with colouring matter; and an interior one, composed of white insipid matter, and contained in a fine network. If a berry of Souzão be squeezed between the fingers, this interior zone, which I call second berry, is squeezed out, and from it can be obtained a perfectly white wine.

It yields much wine, but is bad in cold situations; on warm hillsides, in valleys with strong soils, it is good, and highly coloured; on hills and poor soils it yields scarcely anything. . . . It is *anneiro*, only bearing well every second year. It has the singular property of climbing up trees; there are three varieties, that with red stalks is best; it rarely sets badly, and the flowers are protected by a cap, which preserves the anthers from wasps and dampness. This variety was long unknown on the Douro, and it is stated that it was brought from the banks of the Lima.

Gyrão further states how a special colouring matter may be extracted for the purpose of deepening the colour of wines which are too pale. The method, which is not in accordance with modern pure wine legislation, consists in making a sort of jam with the skins, to which sugar and unfermented juice are added, the whole being boiled over a water bath. He recommends that the mixture, of about the consistency of honey, should be added to the grapes in the vat at the rate of two cantaros per pipe.

Rubião (1884) states that it yields good wine in some localities and bad in others. . . . . As it is *anneira* (bearing only every second year) it is well to note the year it yields wine, so as to prune accordingly.

Villa Maior (1886) mentions it—

as one of the sorts grown at Quinta* do Vesuivo, and one of the most estimable for the special wine there produced. It is planted separately and vintaged apart, as is done with Bastardo, to which it is not inferior(!).

It is chiefly esteemed on the Douro and in Minho for the great abundance and brilliancy of its colouring matter, which even serves to give to other wines which are too pale, a splendid colour, simply by infusion of the skins and its berries. . . . . The best variety of Souzão is the one with a red stalk, and which has leaves washed with scarlet. The interior pulp of the berry does not furnish coloured must; the colour resides in the skin, which is very thick. A test made on 24th August, 1866, gave me 64 per cent. of must with a gravity of 1.099 (12½°B.). It comes into leaf very late.

Figueiredo (1875) states that it is:—

remarkable by the colour with which it is very heavily charged (*Summamente carregada*); it is customary to cut it separately, racking the juice into a vat and leaving the skins to dry, so as to better extract their colour, mixing them later in the lagar (fermenting vat) or distributing them in the casks

Henry Vizetelly† says of it:—

Souzão . . . was brought from the banks of the Lima at the beginning of the last century (18th). It is round and thick skinned, and the must, which is sub-acidulous in taste, is remarkable for the abundance and brilliancy of its colouring matter. A splendid purple shade is communicated to wines of a light tint by merely having the skins of the Souzão grape steeped in them. This grape yields 64 per cent. of must in proportion to its weight, and contains, on an average, some 12 per cent. of sugar.

* Quinta signifies farm or vineyard.
† Facts about Port and Madeira.

As regards its high acidity, the following extract will prove of interest:—*

It is, of all the varieties of the Douro which are largely cultivated, that which presents the highest degree of acidity, being from this point of view even phenomenal. The following are analyses showing the acidity (expressed as tartaric acid per cent.) of a few Portuguese varieties in different vintages:—

Vintage.	1908.	1909.	1911.	1912.
Touriga	.625 ...	.632 ...	.625 ...	.875
Tinta Francisca	.475 ...	.562 ...	.475 ...	.925
Tinta Carvalha	.550 ...	.554 ...	.425 ...	.725
Souzão	.770 ...	.879 ...	.750 ...	1.175

The high acidity of Souzão explains the important part it plays as regards colour in Douro wine making.

Sr. Cincinnato da Costa says of it, in *O Portugal Vinicola*:—

Souzao is, in my opinion, the blackest of all the grapes cultivated in Portugal It is, at any rate, the darkest in colour of the 94 varieties I have more specially studied. Like *Espadeiro de Basto*, Souzão is one of the few Portuguese grapes which have black pulp; it is even blacker than that of *Espadeiro*. The flesh is entirely of a blood red colour, and the must is deep ruby, very deep, as is no other must.

It is a curious fact that, whilst the must of most sorts is cloudy, even after filtration, that of Souzao, passed through cotton wool, is without matter in suspension, almost as limpid and brilliant as a finished wine. . . . . This peculiarity is also shown by another variety, viz., Sercial or Esgana Cão, but in a less striking degree.

Souzão is cultivated as Basto (Northern Portugal); it helps to give to these wines (light dry red) their brilliant colour and the roundness (*Suiradade*) which is characteristic of them. It is also grown in several other Portuguese dry-wine districts in order to deepen colour.

There are two distinct varieties of Souzão—*S. de pe verde* (green foot or stalk) and *S. de pe vermelho* (red foot)—the last is the most esteemed; it is the one with dark-coloured pulp, and which produces the most highly-coloured wine; the shoots are tinted with scarlet. This is the only type which I examined.

At the close of tumultuous fermentation, Sonzão deposits a thick layer of yeast at the bottom of the cask.

Sr. Duarte de Oliveira, in the article on this vine in *Ampelographie*, gives much information, quoting at considerable length from several of the authorities mentioned above. He states how Souzao was used to replace the *Bagos de Sabagueiros* or elder berries which were largely used as a source of colour on the Douro over a hundred years ago. This is an interesting subject, which will be again referred to in a future issue. The following additional information is abridged from his article:—

Souzão does well in all soils; on deep moist soils it bears very heavily. On dry hillsides it sometimes suffers from sunburn. In Douro and Traz os Montes (port wine region) it is pruned short. On the deep granitic soils of Minho it must be pruned long, owing to its tendency to run to wood at the expense of the fruit In this last district, where vines are trained to trees and on high overhead trellises (*em forcado* and *remadas*) it does splendidly and yields heavily; by nature it is a vigorous climber suited for great expansion, but the setting of the fruit is sometimes uneven (*millerandé*). It comes into leaf a little after most varieties, so that it rarely suffers from spring frosts. It ripens rather late, being only quite ripe towards the second or third period (*Pulliat*).

It yields heavily on Rupestria du Lot, but if the weather be very hot at complete maturity the bunches suffer from sunburn. Ripaira Gloire and especially 3309 are to be preferred.

* *Vinificação Moderna*, by Pedro Bravo and Duarte de Oliviera, p. 529.

In Minho it does very well on A.R.G.1.

It is especially good for highly coloured wine, its juice being nearly as deep as that of Alicante Bouschet, but more of a deep ruby or garnet-red colour, which is very durable. Its wine, which has but little bouquet, has much body, and it is readily realized that it should be an excellent blending sort, for the great vineyards, where choicer varieties predominate. For light and delicately-perfumed table wines, however, its proportion should not be exaggerated. On tasting, it is found to have a delicate but full flavour, with a peculiar character, reminding of the after-taste of a peach.

In cooler regions it ripens late, and the stalk remaining green renders the wine hard and astringent unless the grapes be stemmed.

Its fermentation is very long, and, if made alone, after the Portuguese fashion, in vats with a large surface exposed to the air, in spite of repeated trampling with the human foot, complete fermentation takes so many days for its accomplishment that there is a risk of the skins becoming acetic before the gravity has fallen to 0° B.

The opinion expressed by Gyrão as to the double structure of the berry is contradicted, the statement being made that—

The colour is contained exclusively in the skin. By slight pressure an ashen-coloured or at most a slightly reddish juice is obtained, which proves that the colouring matter is by no means to be found in the pulp of the berry, this being contrary to the statement of Antonio Gyrão. The following gravities are mentioned as having been obtained at different localities :—

	Gravity.	Degrees Beaumé.	Sugar per cent.	Absolute Alcohol (vol.)
Murça (Traz os Montes) ...	1.091	12°	21.2	12.6
Castedo (Alto Douro) ...	1.116	15°	27.9	16.4
Castanheiro do Norte (Alto Douro)	1.099	13°	23.4	13.8
Moncorvo (Traz os Montes) ...	1.108	14°	25.8	15.2

The comparison made by Dr. Adelino Costa in 1901 of musts of Souzão and Alicante Bouschet, at Guimarães (Minho) is quoted as follows :—

	Gravity.	Degrees Beaumé.	Sugar.	Alcohol.
Souzão or Vinhão ...	1.083	11°	19.1	11.2
Alicante Bouschet ...	1.071	9½°	15.9	9.3

Sr. de Oliveira comments on the enormous difference in gravity to the advantage of Souzão, "which has certainly a wine-making value superior to Alicante Bouschet in every direction, unless, perhaps, that of yield." As regards the parts played by Souzão for the making of green wines*, he quotes a letter received from Sr. Antonio Christino, in which he wrote :—"This vine finds itself here in its true home, and constitutes to-day the basis of choicest wines of Minho."

The following ampelographical description is given :—

Vine.—Vigorous; trunk cylindrical; bark light-brown, easily detachable in short strips.

Buds.—Breaking at a medium period; young leaves yellowish above and whitish beneath.

Canes.—Long, round or slightly flattened, trailing, striated with russet veins; when matured, of a vinous chestnut, the striations becoming deep sepia; internodes very irregular (6 to 12 cm.)†; knots only slightly marked, brittle, tinted with carmine; tendrils numerous, very long.

Leaves.—Three lobed, thick, pliable, large, as broad as long, yellowish-green on both sides, but the upper side is deeper, cottony, at the end of the season (in late summer) blotched and dotted with carmine red and in October becoming yellow smeared with red; underside woolly; veins prominent and light-yellow on the underside, of same colour on the upper side, but later in the season assuming a carmine colour; substance very thin; the two sinus scarcely formed by the development of three teeth of the upper lobe, the terminal lobe being very large and projecting forward, sometimes the sinus are U-shaped; petiolar sinus deep, almost closed; teeth alternating, large, pointed, and carmine when the grapes are ripe. Leaf stalk long, cottony, striped with red.

* The light dry red wines of high acidity grown in the north of Portugal.
† 2¼ to 4½ inches.

Fruit.—Bunches fairly large, long, cylindro-conical, regularly filled, but n very close. Nearly always shouldered, with one or two bunchlets hanging l long stalks, which have the form of true bunches; sometimes the stalk is divide so as to bear two similar bunches; stalk long, strong, flattened; first ramification short and woody; pedicels short, stout, terminated by a rather strong swelling dark-red; core short, conical, deep vinous red. Berries medium, spherical, of a bluish-black colour, solidly attached to the core; flesh fairly firm, juicy, not very sweet, and not very refined; skin thick, like parchment, rich in colouring matter; pips per 100 berries—24 with two, 52 with three, 24 with four.

Cornifesto.

Synonyms: CORNIFRESCO, CORNIFEITO, TINTA BASTARDEIRA.

Cornifesto is one of the characteristic varieties of the Douro; yielding, as it does, wines of good colour and body it may be classed as belonging

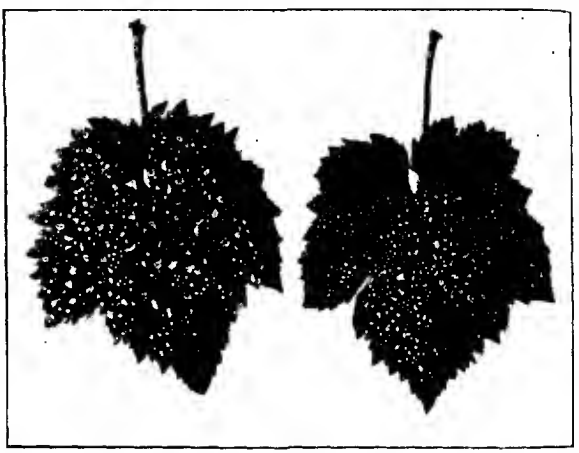


Fig. 11.—Leaves of Cornifesto (about one-third natural size).

Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907. The leaves are spotted with Bordeaux mixture, sprayed to prevent Downy Mildew (Plasmopara viticola).

to the Touriga type, though its wine does not perhaps reach the same standard of quality as that variety. A peculiarity which renders it of considerable interest is its marked tendency to throw a second crop. In all probability it will be found capable of yielding satisfactorily in seasons when the first crop has been destroyed by frost or hail, a consideration of great value in vineyards liable to such visitations.

It is first mentioned by Lacarda Lobo (1790) as a black variety cultivated in several Douro vineyards. Gyrão (1822) tells us that—

Cornifesto yields much and good wine; it possesses the peculiarity of bearing a second crop on the lateral canes (*pela vara adiante*), which alone would equal the yield of some other vines; this second crop constitutes a sort of supplement to the numerous and handsome bunches which it yields. It likes strong soils.

Villa Maior (1866/69) mentions having seen it in several localities in the Alto Douro, where it is highly esteemed; it resists odium, yields well, and produces good wine. A test of the must at Moncorvo gave a gravity of 1.120 (15½°B.), and acid 0.21 (as sulphuric). Another determination by the same author in 1875 resulted in a yield of must of 53.5% of the weight of the grapes, the gravity being 1.090 (12°B), and acidity 0.188.

Vizetelly* says of it:—"The species of vine known as the Cornifesto has the peculiarity of throwing out along its branches a number of productive off-shoots.

Fig. 12.—Bunch of Cornifesto, reduced from coloured plate in "Ampelographie" (about one-third natural size).

Its fruit possesses the usual characteristics of the Alto Douro grapes, being thick-skinned, sweet, and pulpy, whilst the yield in must and sugar is of a fair average."

Sr. Cincinnatto da Costa† mentions it as a good black grape of the Douro, bearing abundantly, its bunches being as large as they are numerous. He agrees with Villa Maior regarding the production of second crop; nevertheless, the yield in juice is not very high.

* Facts about Port and Madeira. by Henry Vizetelly. 1880.
† O Portugal Vinicola.

The article concerning this variety in *Ampelographie* is contributed by Sr. Duarte de Oliveira, from which the following is abridged:—

The name of the variety is appropriate—*Corni* signifying horn-shaped, and *festo* meaning bent;-in other words, bent horn, referring to the bunch, which is curved in a peculiar manner.

Curiously enough, Columella, at the commencement of the Christian era, wrote of a vine named *Ceraumia*, which appears to have had some similarity with Cornifesto. "We call this vine *Cruneolus*, according to Greek nomenclature. Here we have it both black and white, and it bears three times a year (no doubt referring to the large amount of second crop). Cornifesto is, of recent years, a scion much used in grafting, and is to be found, nowadays, in the majority of Alto Douro vineyards."

It comes into leaf late, but ripens at the same time as most other sorts, except in moist situations, where it ripens with difficulty, though it produces numerous bunches. Especially when grafted on resistant stocks it yields fine bunches, well filled with juicy grapes. Being a good bearer, and resisting fungus diseases, it is given a high place in the great port wine vineyards, since it supplies colour, which is lacking in many varieties cultivated in these vineyards. It possesses excellent affinity for the majority of resistant stocks, doing specially well on A.R.G.1, the horn shape of each bunch being accentuated. It does best on very vigorous stocks.

On the Douro it is either pruned short, or according to the "double Guyot" method (on vines which are strong enough). It may even be pruned very long, when the yield is heavy; if pruned too long, however, though the bunches are numerous, they are small and poor.

It plays an important part in the making of port wine. Although not of ideal distinction, its wine is of intense colour and has much briskness. It livens up the softness of other sorts, and gives them the "life" which is missing. Wine made from it alone is coarse and common, but mixed with Alvarelhão, Bastardo, Donzellhino, do Castello, Touriga, and other celebrated varieties, the value of Cornifesto for port wine making will be immediately recognised. If not present in all vineyards, it ought to be; without Souzão and Cornifesto the wine would not possess enough colour.

Cornifesto became popular with the change in fashion which demanded darker ports. It is chiefly by the extensive use of Cornifesto, Souzão, and Touriga that this transformation was brought about. The following ampelographical description is given:—

Vine.—Strong, vigorous; spreading grower; bark dead leaf colour, detaching in long fibrous ribbons.

Buds.—Large, broad at the base, and pointed; young leaves five-lobed, silky above, yellowish-white, margined with bright carmine; cottony beneath, of an ashy white; teeth scarcely indicated.

Canes.—Long, compressed, straight and striated; internodes from 4 cm. (1½ in.) at the base, and from 8 to 10 cm. (3 to 4 in.) at the tip, of a brownish tint; knots small, reddish; tendrils numerous, slender.

Leaves.—Medium, as long as broad; substance not very thick, light-green, glabrous above, slightly downy beneath; five-lobed; sinus not deep, especially the lateral ones, which are scarcely indicated; petiolar sinus forming a small oval opening; main veins of yellowish colour, rather prominent on the under side, with reddish spots; teeth long, irregular, sharp. Leaf stalk striated, long, reddish.

Fruit.—Bunches large, long, close, irregularly cylindrical, often horn-shaped, with cavities produced by missing berries; stalk medium length, cylindrical or flattened, sometimes divided into two or three, bearing secondary bunches smaller than the principal one; pedicels strong, short, terminated by a large warty swelling, of vinous colour; core short, pulpy, red in the centre, adhering strongly to the berry. Berries medium, spherical, black, with bluish reflection; skins thick, hard and elastic, enduring matter abundant; pulp sweet, fairly juicy; pips per 100 berries—16 with two, 37 with three, 33 with four, 12 with five, 2 with six.

Mourisco Preto.

Synonyms: Mourisco tinto, Uva Rei, Mortagua, Olha de Rei, Tinta Parda, Valenciana, etc.

In Mourisco Preto, or, as it is often called, Mourisco Tinto (tinto and preto both meaning dark coloured or red) we have what may be

termed a dual purpose grape, or one which is of value as a table grape as well as for conversion into wine. Though not so showy as the large berried grapes in favour on the Melbourne market, in its native Portugal it is largely grown and highly esteemed for table use in the fresh state.

For wine making it may almost be classed as belonging to the Bastardo type; its wine, though lacking somewhat in colour, is remarkable for bouquet and flavour, though not to quite the same extent as Bastardo. It is, nevertheless, essentially a quality variety, in this respect being an exception to the general rule that table grapes do not yield high-class wine. It is a variety which should prove of interest in northern Victoria as one of the port wine sorts, possessing many of the qualities of the Bastardo without its serious defect of drying up in hot weather.

Its comparative resistance to phylloxera led to great hopes being founded on it when the vineyards of Portugal were first ravaged by the

Fig. 13.—Leaves of Mourisco Preto (about one-third natural size).

Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907.

insect. Much credence was given to the common fallacy that phylloxera was the result of a general weakening of the vines, resulting from repeated propagation by means of cuttings, and that a return to nature's methods (by seed) would permit the raising of vigorous vines capable of resisting phylloxera. Large areas were replanted with seedling vines, mainly Mourisco, but without avail; the seedlings succumbing as completely as other viniferas, if rather more slowly.

Mourisco is a very old Portuguese variety, the white variety being mentioned as early as 1712 by Vincencio Alarte.* The red variety seems to have been first mentioned by Lacerda Lobo in 1790. According to tradition on the Douro, it was one of the most widespread vines, though it lost ground somewhat owing to imperfect setting.

* Sr. Duarte de Oliveira in *Ampelographie.*

Gyrao (1822) describes it, among the black grapes of the Douro, as one which

yields much and very good wine; it is early and requires strong soil; it should be pruned to spurs, because each shoot only bears two bunches. It is good to

Fig. 14.—**Bunch of Mourisco Preto, reduced from a coloured plate in "Ampelographie" (nearly half natural size).**

eat and for wine. Its grapes are very sweet. . . . It is best trained low, but may also be trained on trees; the wine is full (*coberto*), and its grapes ripen early; it likes strong soil, but also prospers on poor land. The wine made on the Douro by Srs. Villares from this grape was excellent in colour, flavour, and bouquet; it made a good blend with Souzão.

Rubiao (1844) states that—

It is one of the red grapes of the Alto Douro, which, in spite of having a thick skin, yields good wine; it requires spur pruning.

According to Villa Maior (1866-75),

It is called Uva Rei at Macedo, and also in Traz-os-Montes, but must not be confounded with the Mourisco of Minho (North Portugal), which is entirely different. At Vesuvio (Alto Douro) it yields excellent wine, and ripens early; it is in general planted apart from other sorts, and its wine made separately. The yield of must is given as 55 per cent. of the weight of the grapes, with a gravity of 1.120 (15½° B.), and containing 0.188 per cent. of acid (as sulphuric). On the Douro it comes into leaf at a medium period.

Ferreira Lapa (1866-74) states that—

At Azeitão, on the Tagus, a district producing dry wines, Mourisco Preto, or Mortagua, is very productive, but suffers extremely from oïdium. It is a variety from which a wine is made without mixture of others; a special wine which belongs to the category of choice or of choicest (*Finos ou finissimos*).

According to Dr. Paulino Oliviera (1878),

On the Douro Tinto Cão, Rabo de ovelha, Alvaraça, Souzão, and especially Mourisco, resist phylloxera much more than other varieties; in vineyards completely lost, where portions have been already eradicated, plantations of Mourisco have been preserved, which, in spite of phylloxera, continue to yield a regular crop.

Visconde de Villar Allen (1878-79) also writes concerning its phylloxera resistance, and advises raising seedlings of it for the regeneration of the vineyards.

Vizetelly* says—

Next comes the Mourisco Preto or Tinto, which the Trazmontanos have nicknamed the "Uva Rei," or King Grape, thick-skinned and pulpy like Touriga, less sweet, but pleasanter in flavour, and yielding in must 55 per cent. of the weight of its bunches.

Sr. Duarte de Oliveira, in *Ampelographie*, quotes from several of the above authors, and gives further particulars from which the following is abridged:—

During some years after the phylloxera invasion, Mourisco Tinto regained great favour with vine-growers. Important plantations were made with this vine, which was wrongly considered resistant, a mistake which has also been made in connexion with some other pure viniferas.

The wine-making value of Mourisco was affirmed by Villa Maior, who said, in 1876, "it is one of the finest and most precious sorts cultivated on the Douro."

Mourisco Tinto is grown as a table grape in all the Portuguese vine districts, but as a wine grape it is almost exclusively to be found in Traz os Montes and the Douro, being largely grown in some of the best port wine vineyards. In North Portugal, it is considered one of the best table grapes, playing as important a part as Chasselas does in France.

It has many of the qualities needed in an excellent table grape, and much resembles Black Hamburg.

In good years, and pruned long, it is very productive. In order to acquire perfect ripeness, it needs rich soil and warm regions like the Alto Douro. It ripens between the second and third period (Pulliat), and only rarely attains a jet-black colour. Mourisco suffers little from oïdium, and mildew rarely damages it.

Its wine is of the most delicate flavour, and, mixed with other grapes, it communicates to the blend a very choice bouquet. On the Douro it is very fruity (liquorex), but for port wine it is blamed with not having colour enough. Ferreira da Silva is quoted as stating that its wine contained alcohol 13 per cent. by volume (22.8 per cent. proof); dry extract, 27.3 per cent.; and acid, 2.2 per cent. (as sulphuric). He also quotes M. J. Joulie as giving the gravity of its must in Minho as 9 degrees B., and in Traz os Montes (Murça) as 13 degrees B.

* Facts about Port and Madeira.

The following ampelographical description is given:—

Vine.—Exceedingly vigorous; trunks reddish, colour of wine lees, bark detaching in small plates.

Canes.—Slightly flattened, very strong and long, semi-erect, light-brown with vinous red striations, internodes very long, between 10 and 14 c.m. (3.9 to 5.5 inches); knots swollen; tendrils numerous, exceptionally large and strong; young growth almost glabrous, yellowish-green; young leaves with a slight brick-red tint.

Leaves.—Five-lobed, as broad as long, dark-green and glabrous above, yellowish-green and with little cotton below. Upper sinus somewhat irregular, more or less closed, the lobes meeting; secondary sinus sometimes scarcely marked; petiolar sinus very deep and open, though frequently through the overlapping of the lobes only a small obovoid opening is left. Substance of leaf thick, bulgy, almost leathery; veins very marked on both sides; teeth large, uneven, sometimes sharp, sometimes rounded, mucronate. Stalk long, grooved, glabrous.

Fruit.—Bunches very large, often enormous, elongated, pyramidal, winged; stalk strong, very long; pedicles thin, long, terminating in a fairly thick swelling; core short, white, with a small vinous spot in the centre, with much pulp adhering to it. Berry very large, almost spherical, of a jet-black colour, with bluish reflections, ripening unevenly, so that some not quite ripe are of a rosy-black, as though velvety. Skin not very thick; flesh firm, very juicy, and of a refined taste; on rich moist soil, before complete ripeness, the berries are already very sweet, and of almost the same colour as Chasselas Rose.

Donzellinho Do Castello.

Donzellinho, or, to be more correct, the Donzellinhos, since there are no less than five sub-varieties, are very ancient Portuguese vines, being mentioned by Ruy Fernandez so early as 1532 among the sorts cultivated at Lamego. They are essentially "quality" varieties, the red sorts being of Bastardo type, though the wine they yield is lighter in colour and of rather lower alcoholic strength than that of Bastardo.

Of the five sub-varieties, that known as Donzellinho do Castello is the most valuable; the others may be briefly mentioned as follows:—

Donzellinho Gallego.—A poor bearer, though it yields an excellent wine, of somewhat deeper colour than that of Donzellinho do Castello. The name Gallego, which means from Galicia (Spain), is really a term signifying inferiority, and is illustrative of the contempt in which the Galician labourer, who does most of the hard work on the Douro, is held by the Portuguese peasant. This feeling is probably as much due to envy of his capacity for hard work as to political reasons.

Donzellinho Branco (white).—Yielding a very highly perfumed white wine.

Donzellinho Malhadò.—A queer marbled or piebald grape, grown more as a curiosity than for use. Its origin has been attributed (no doubt erroneously) to the grafting of the red on to the white sub-variety, so that it would constitute a sort of a sexual hybrid.

Donzellinho Rosa.—A pink sub-variety of little practical value.

Donzellinho do Castello, in spite of the quality of its wine, is very liable to suffer from sunburn in a dry autumn, a feature which is against its extensive use in northern Victoria. It is mentioned by Rebello da Fonseca (1791) as softening and sweetening the roughness of Souzão and Alvarelhao, increasing the suavity of the bouquet.

Other authorities speak highly of it; notably Gyrão (1822), who states that—

It gives much and good wine; wants strong and cool soil. On warm hillside the fruit dries up very much. Srs. Villares found that the wine made from it was good, though of little colour. It is a vine of such good quality that, like

Alvarelhão, even laterals and water shoots produce grapes, forming an exception to the rule.

Villa Maior (1865-69) mentions it as one of the predominant varieties in the quintas* of Silho, and of Pedra Caldeira; it was also selected

Fig. 15.—Bunch of Donzellinho do Castello. Reproduced from "O Portugal vinicola" (reduced to three-fifths natural size).

for cool and windy parts of the Quinta do Noval—a choice justified by its earliness, it being thus possible to insure the simultaneous ripening of the grapes throughout the quinta.

* Quinta signifies farm or vineyard.

Vizetelly* describes it as

a bluish-black grape which combines a slight acidity with a delicate sweetness, and yields a clear must charged but slightly with viscous matters.

Sr. Cincinnato da Costa† describes it as one of the choicest varieties in the Douro region—

The grape is black, but not deeply coloured. The crop is generally mediocre, and the yield of juice likewise. . . . Although not very profitable as regards yield, it is much appreciated owing to the excellent qualities of its wine. It enters largely into the composition of the best of the generous wines of the Douro.

The following extracts are abridged from Sr. Duarte de Oliveira's article concerning this vine in *Ampelographie*:—

In the ancient Douro vineyards, Donzellinho do Castello was grown in large proportion, contributing considerably to the quality of the wines of the Douro region. It lost favour owing to the liability of its fruit to shrivel on dry sunny situations. Prior to phylloxera, it played a predominant part in several of the leading port wine vineyards.

It does well on all usual stocks, yielding heavy crops on A.R.G. 1 and Rupestris du Lot. On the deep rich soils of Minho it thrives on Solonis, growing with great vigour. It is here trained on high trellises, and even on trees, for the production of green wines (light dry table wines).

In the port wine region it is pruned short or medium. In cold, moist districts its wood sometimes ripens in an unsatisfactory manner. On soils which suit it, it is a good bearer, and very resistant to oidium, though it suffers somewhat from mildew.

It is one of the choice wine varieties of Douro and Traz os Montes, especially of the latter, yielding a delicious wine, of light colour, with a suave perfume, and of light body. Crushed with a variety containing more colour, a wine is obtained reminding of that of Cabernet Sauvignon. The grapes become sweet before they have acquired the colour characteristic of complete ripeness, which takes place between the first and second periods (Pulliat).

The following ampelographical description is given:—

Vine.—Vigorous; main stem strong; erect grower, bark dark-brown, much fissured, detaching in short thin strips.

Buds.—Large, swollen, short, but very prominent; young leaves white, very silky on both sides, pale-green above, and marked with carmine.

Canes.—Long, straight, cylindrical, brittle; glaucous green, sometimes lightly striped with vinous red whilst still herbaceous, of medium thickness; when ripened they pass to a reddish-yellow chestnut colour; internodes long (8 to 12 c.m.—3.1 to 4.7 inches), with a slight depression for half their length; knots swollen; tendrils very numerous and strong, generally bifurcated.

Leaves.—Large, broader than long, bulgy; faintly five-lobed, almost entire; upper sinus not deep, the secondary ones do not exist, or are usually so slightly marked that the leaf is three-lobed, petiolar sinus deep, distinct, in the form of an inverted lyre; substance very thick, dark-green above, sometimes with reddish blotches; greenish-white and woolly below; veins well marked on both sides; teeth shallow, irregular, mucronate. Leaf stalk strong, striated with red and dotted with deep chocolate.

Fruit.—Bunches numerous, medium or small, cylindro-conical, well filled, sometimes slightly winged, frequently some of the tendrils bear little bunchlets of four to eight berries; stalk medium, cylindrical, the upper part becoming woody, and the lower part remaining green; pedicels long, thin, with a vinous-coloured swelling; core fairly long, red, wine-coloured, adhering to the berry. Berries medium, almost ovoid, often unequally angular through compression in the bunch, bluish-black; pulp soft, juicy, sweet, and perfumed flavour; skin hard, with very little colouring matter; stigma persistent on nearly every berry, hard, and thus forming a sort of small point, of a dead leaf colour (when handled this point can be easily felt; this is one of the Portuguese varieties in which this character is most marked); pips per 100 berries—12 with one, 32 with two, 48 with three, 8 with four each.

(To be continued.)

* Facts about Port and Madeira, by Henry Vizetelly.
† O Portugal Vinicola.

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Government Apiculturist.

XXVI.—THE HONEY FLORA OF VICTORIA.

(Continued from page 486.)

The River White Gum (*Eucalyptus radiata*. Sieb.).

(Fig. 53.)

A fairly tall tree, with a hard, black bark on the lower portion of the trunk, but smooth on the upper part of the tree. The sucker leaves are thin and stalkless or almost, stem surrounding resembling those of the narrow-leaved Peppermint (*E. amygdalina*); they are opposite, narrow, and about 3 to 4 inches long. The leaves of adult trees are lance-shaped, generally about 6 inches long on a stalk about 1 inch long.

The veins of the leaves are not prominent, the marginal one removed from the edge. The flowers are very numerous, there being up to thirty in a cluster, which occur at the shoulders of leaves; the flower-cup is top-shaped, tapering into a long thread-like stalk, the lid (top) of the bud is blunt. The fruit is numerous, small, pill-shaped on thread-like stalks, rim thin, contracted.

The timber is pale, easily split and worked, and appears suitable for building purposes. The leaves yield a useful oil.

This tree is found in Victoria along rivers and creeks, principally in the eastern part of the State.

The Grey Ironbark (*Eucalyptus paniculata*. Sm.)

(Fig. 54.)

A tree of medium size, usually 60 to 70 feet in height, with a diameter of 2 to 4 feet; exceptionally it attains a greater size. It is found chiefly in New South Wales, but extends into Eastern Victoria, occurring at Mount Taylor.

It is known by different local names such as Grey Ironbark, White Ironbark, on account of the paleness of the timber as compared with the Red Ironbark (*Eucalyptus sideroxylon*), also as Ironbark and Red Ironbark, in reference to the pale-red colour of the wood.

The leaves are scattered, of rather thin consistence, narrow lance-shaped, long lance or sometimes broad-lance shaped, slightly curved, paler and dull coloured beneath, hardly shining on the upper surface. The lateral veins of the leaves are very spreading, faint and numerous, the marginal vein close to the edge of the leaf.

The flowers occur in tufts or panicles, hence the specific name "paniculata." A few of the flowers, however, also appear at the shoulders of leaves and in single clusters of from three to eight flowers on slender angular stalks. The buds are egg-shaped, tapering into the stalk, the calyx (flower cup) generally longer than the half-round, more or less pointed lid. The fruits, which are sometimes much smaller

than the normal type, are somewhat pear-shaped, slightly contracted at the summit, three to four, or rarely five-celled, with two to four angular streaks.

The bark is of the hard rugged kind as indicated by the popular name; it is often pale-coloured, even grey, while that of the Red Ironbark (*Eucalyptus sideroxylon*) is almost black.

Fig. 53.—The River White Gum (*Eucalyptus radiata*, Sieb.).

The timber, which is pale pink when freshly cut, becomes darker with age, is not excelled by any other timber for combined strength and durability.

The Grey Ironbark is not easily confused with any other Victorian species, as only two others, the Red Ironbark (*E. sideroxylon*) and the

Silver Top (*E. Sieberiana*) have the characteristic bark. The Red Ironbark has a deep red wood and a black bark as distinguished from the pale pink wood and paler or greyish bark of the Grey Ironbark. Both these species grow on ironstone ridges and dry, poor land, while the Silver Top (*E. Sieberiana*) inhabits moister situations.

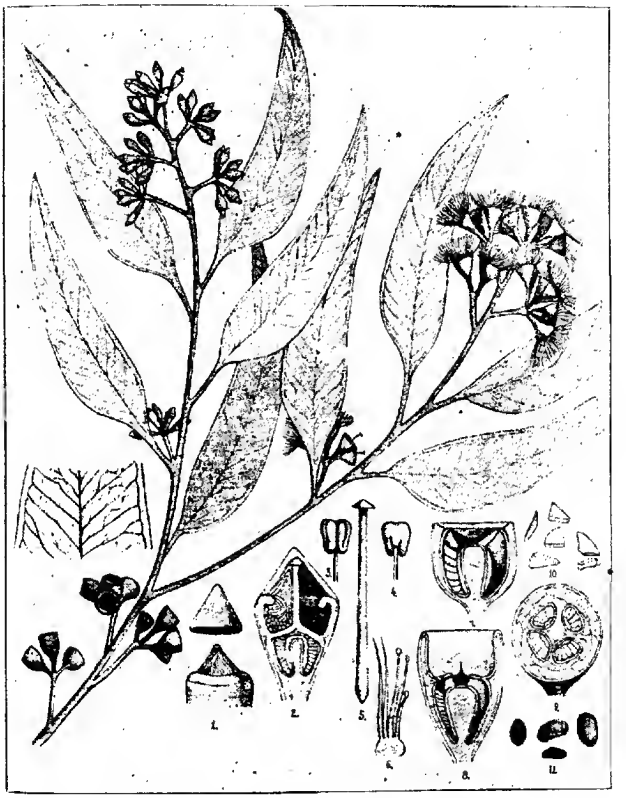


Fig. 54.—The Grey Ironbark (*Eucalyptus paniculata*, Smith).

THE SHINING GUM (*Eucalyptus nitens*. Maiden).

A very large tree, growing to a height of 200 to 300 feet, with a stem diameter from 2 to 17 feet. It is closely related to the Mountain Gum (*E. goniocalyx*) of which till lately it was considered a variety, but is now classed as a distinct species. It is known by local names, such

as White Gum, Silver Top, and Silver Top Gum in reference to the smooth and shining bark of the upper part of the trunk.

The bark is of the White Gum kind, hanging in strips, and more or less rough at the butt, the upper portion of the trunk smooth and even shining.

The timber is straight in the grain, flesh-coloured when fresh, but drying very white.

The leaves in the mature state of the tree are lance-shaped, slightly curved, nearly even-sided, equally green on both sides, somewhat shining and thickish, the veins spreading, the marginal vein distant from the edge of the leaf. Mature leaves may attain a length of over 12 inches, and a width of 3 inches, but usually they are much smaller. juvenile leaves, bluntly lance-shaped, or heart-shaped and stem-clasping, equally green on both sides and somewhat frosted; branchlets square and evenwinged (as in Blue Gum seedlings).

The buds are usually pale-brown, curved and angled, up to seven in a head, six stalkless buds surrounding a central one on a common stalk ¼ inch long; lid of bud pointed and longer than the flower cup.

Fruits shining, up to seven in a cluster, egg-shaped, slightly angled.

The Shining Gum is found in Victoria near Mount Baw Baw and similar localities.

As already stated, the Shining Gum is closely related to the Mountain Gum (*Eucalyptus goniocalyx*). The differences which separate the two species are—

1. The Shining Gum attains a size never attained by the Mountain Gum.

2. The timber of the former species appears to be fuller in the grain, less interlocked and less durable than that of the Mountain Gum.

3. The young branchlets of the Mountain Gum (*E. goniocalyx*) do not appear to be winged at any time, as in the species here described.

4. The fruits of the Shining Gum (*E. nitens*) are much smaller and shinier than those of the Mountain Gum (*E. goniocalyx*).

In regard to nectar and pollen production no distinct and separate information is available, as the Shining Gum has so far not been distinguished as a distinct species by apiarists.

The Yertchuk (*Eucalyptus Consideniana*, Maiden).

(Fig. 55.)

A medium-sized tree, with a grey tough bark of the character well known as "peppermint," very like that of the Peppermint Gum (*E. piperita*, Sm.), but very different from that of the Silver Top (*E. Sieberiana*, F. v. M.), in the company of which it often grows. In Gippsland it seems more of a Stringybark, with rough bark (as in other locations) right to the tips of the branches. It grows most freely upon the rather poor sandy and clay lands of the coastal country of Eastern Victoria, ascending also the coast ranges.

Yertchuk is the aboriginal name of this tree, which is also known as Peppermint, Messmate, and White Mahogany.

The leaves of mature trees are commonly broad lance-shaped, unevensided, and somewhat curved; up to 9 inches in length and nearly 2 inches in width; rather thick in texture. Colour equally green on both sides, dull or shiny, blue-green or bright sap-green. Veins of

Fig. 55.—The Yertchuk (*Eucalyptus Considenеana*, Maiden).

leaves strongly marked, spreading from the base, the marginal vein a considerable distance from the edge. Leaves mostly hanging straight down.

Juvenile leaves (sucker and seedling leaves) narrow lance-shaped, opposite but soon becoming alternate. They are narrower than those of the Silvertop (*E. Sieberiana*. F. v. M.), and of the Peppermint Gum

(*E. piperita*. Sm.) to both of which the Yertchuk (*E. Considineana*) is closely related and possibly a hybrid of these two species. The sucker leaves of the Yertchuk are of a rather strong peppermint odour and often of silvery appearance. The young branchlets and seedling stems are angular.

Fig. 56.—The Grampians Gum (*Eucalyptus alpina*, Lindley).

The flower clusters have numerous buds, with the typical form of the Narrow-leaved Peppermint (*E. amygdalina*), to which also the shape of the bud and the depressed lid belong, which, however, in the Yertchuk is sometimes pointed.

The fruits are generally pear-shaped, often nearly conical, rather more than ¼-inch in diameter. The rim of the fruit broad, smooth.

well defined, and usually red in colour; it is somewhat like that of the Brown Messmate (*E. haemastoma*), but the latter is a gum, or smooth-barked species.

This species can be most conveniently distinguished by its pear-shaped fruits and peppermint bark, its narrow sucker leaves are also characteristic.

The timber is pale-coloured, with gum rings, remarkably like that of the Peppermint Gum (*E. piperita*. Sm.). It is soft and stringy, not nearly so good as that of the Silvertop (*E. Sieberiana*, F. v. M.).

Nothing is yet known of the value of the Yertchuk to the apiarist.

The Grampians Gum (*Eucalyptus alpina*. Linde.)

(Fig. 56.)

A dwarf eucalypt of no economic value, and remarkable for being confined to a restricted area in the Grampians, where it is found at an elevation of over 3,000 feet.

It was discovered by Colonel Sir Thomas Mitchell, when that eminent explorer discovered the Grampians, and ascended, in July, 1836, the mountain now known as Mount William.

It is probably the slowest growing of our eucalypts, which is quite remarkable, because its nearest systematic relative is the Blue Gum (*E. globulus*), our fastest growing tree, which it much resembles in its warty buds and fruits.

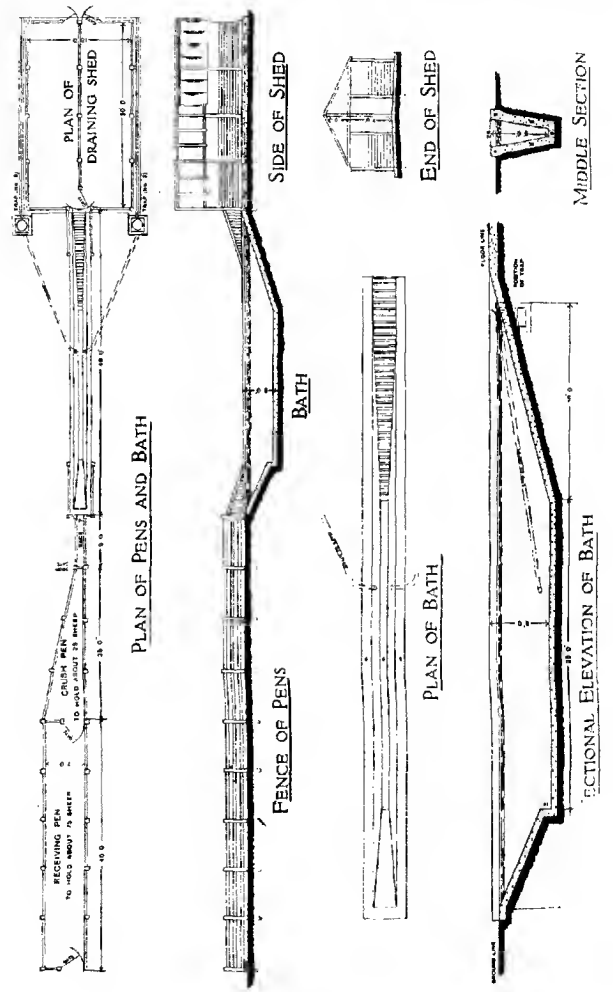
(*To be continued.*)

My own experience, says a correspondent in an agricultural paper, is that the son of a small farmer is invariably an all-round man, able to milk, plough, tend cattle, and so on, whilst the son of the agricultural labourer "follows father's footsteps"—and, like the father, is a one-job man. The factor of personal attention, then, is worth a lot in the handling of dairy cows, and worth much more in the raising of calves, another feature of farming to which the small man should give more attention. "Who feeds the calves?" I recently asked the owner of as bonny a lot of chubby youngsters as I have ever seen. The answer was just as I expected: "The same one who feeds the babies." Nobody like a woman for looking after a calf, or anything young, especially when the woman, as in the case quoted, "owns the man who owns the calves." Just when a man has got tired of tending a delicate calf, and bids it good-night with a fervent heart-wish that it will be dead in the morning, is the time when the woman lends her helping hand. It is a remarkable thing that amongst small farmers in Ireland "the woman of the house" makes herself responsible for the health and comfort of the calves; while "himself" looks to almost everything else except the hens.

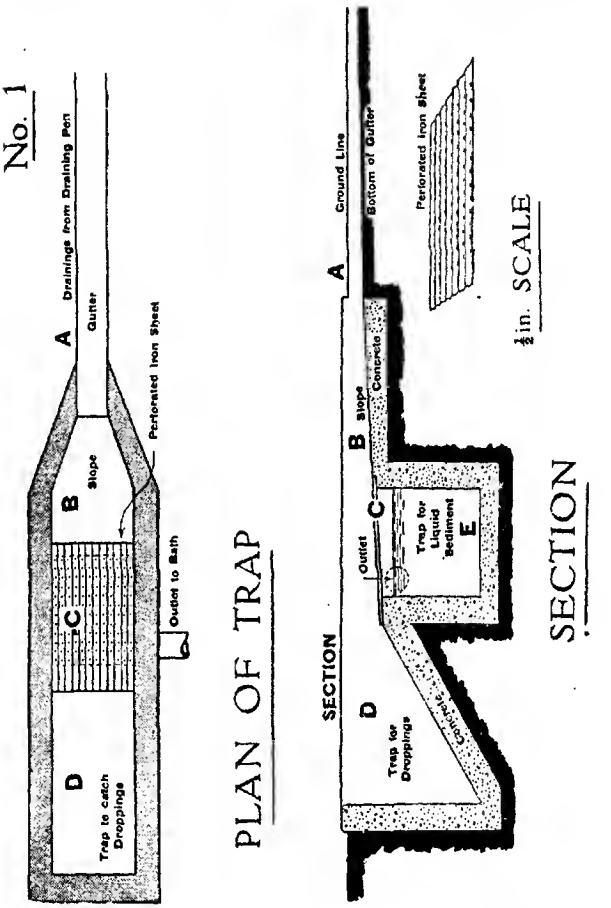
A SHEEP DIP.

By A. W. Curlewis, Inspector of Stock.

In connexion with plans and descriptions of sheep dips which appeared in *Journal of Agriculture* for July last, a further complete set of plans and details of material required, &c., of a "walk in" dip,



forwarded to the Director of Agriculture by Messrs. Cooper and Nephews, 544 Collins-street, Melbourne, is now submitted for insertion in this issue.



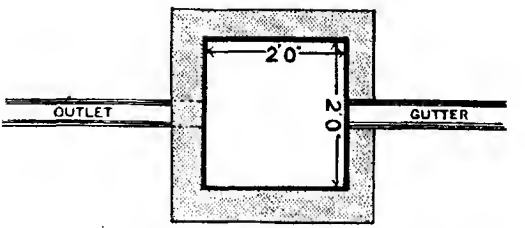
Acknowledgment must also be made to the same firm for plans of dips shown in Figs. 1 and 5 of the above-mentioned article.

The "walk in" has not so far been generally used in this State, and there is a diversity of opinion on the part of sheep-owners regarding its merits.

I concur in the view expressed by Messrs. Coopor and Nephews a to its being the most humane method of dipping; and, provided th sheep took the swim kindly, without undue forcing in starting them much labour and vexation to all concerned would frequently be avoided.

In dipping sheep which have already been through the operation, especially old ewes, there is always a difficulty in getting them into and then along the race leading to the bath; this obtains more or less in any dip; but in slide dips, which are most common, they arrive at the point

No 2



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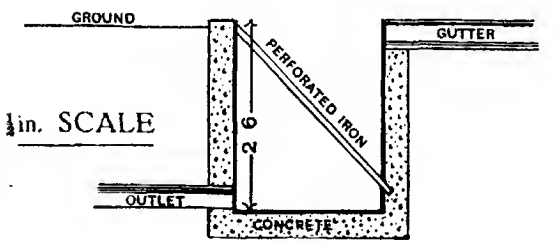


½in. SCALE

SECTION

where they can resist no longer before they are beyond reach of a "penner" leaning over the low fence of the race.

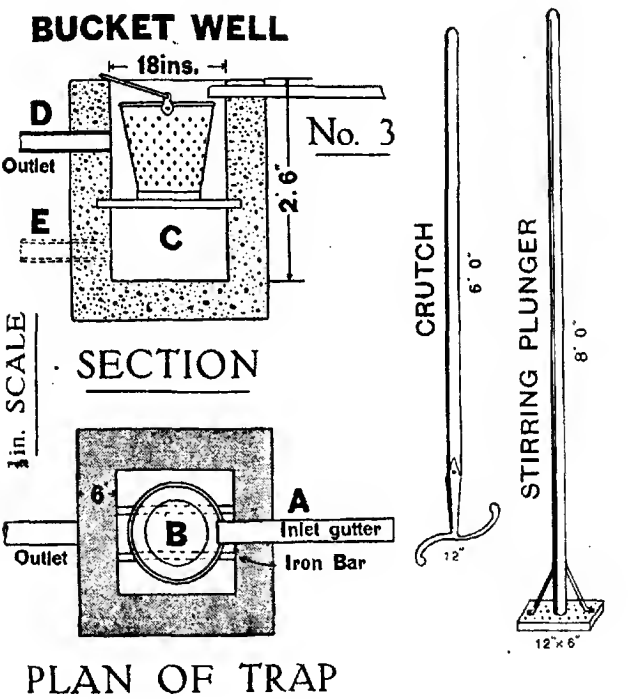
It would be interesting to get definite information as to whether sheep dipped only in "walk in" dips from the time they were lambs dread the operation less than they appear to do after being put through the ordinary dip. It seems quite possible that sheep going through without much forcing, and minus the shock of the sudden involuntary plunge, might face the ordeal in subsequent years with less fear.

When opportunity occurs further particulars will be obtained on the matter and given to readers of these columns.

MATERIALS REQUIRED.

FOR CONCRETE—Broken stone, 6 parts.
Clean sand, 2 parts.
Cement, 1 part.

FOR CEMENT PLASTER—Clean sand, 2 parts.
Cement, 1 part.



QUANTITIES REQUIRED.

FOR CONCRETE 6 INCHES THICK—

For Bath—10 cubic yards, broken stone or gravel.
3½ cubic yards clean sand.
11 casks or 33 bags cement.

PLASTER, ½-INCH THICK (AREA, 58 SQ. YARDS)—Clean sand. 16 cubic feet.
Cement, 2 casks or 6 bags.

CONCRETE, 6 INCHES THICK—

For Draining Floor—12 cubic yards broken stone or gravel.
4 cubic yards clean sand.
13½ casks or 40 bags cement.

PLASTER ½-INCH THICK—(AREA 75 SQ. YARDS)—20 cubic feet or ¾ cubic yard sand
2½ casks or 7½ bags cement.

TOTAL QUANTITIES.

Broken stone or gravel, 22 cubic yards; sand, 9 cubic yards; cement, 29 casks or 87 bags.

MATERIALS FOR DRAINING SHED.

14 Side posts, 11-ft., 4 x 3
5 Centre posts, 14-ft., 4 x 3
26 Rafters, 10-ft., 3 x 2
1 Ridge, 30-ft., 4 x 1½
3 Beams, 18 ft. 6 in., 3 x 2
8 Roof battens, 30-ft., 3 x 1
8 Side battens, 30-ft., 3 x 1½
8 End battens, 8-ft., 3 x 1½
8 End battens, 7-ft., 3 x 1½
34 Sheets 10-ft. iron.
6 Lengths 14-in. ridge cap.
Wings—4 11-ft. and 4 9-ft., 3 x 2 (Splash boards at each end of bath)
60 feet super. 6 x 1 board.

FOR GATES—24 feet 3 x 2, 48 feet 3 x 1, and 3 pairs 18-in. tee hinges.

"NATALITE," A MOTOR FUEL CONSISTING OF ALCOHOL AND ETHER, MADE FROM MOLASSES.

Attempts to use alcohol as a substitute for petrol or gasoline in the internal combustion engine have been numerous, but certain difficulties—the necessity for high compression in the cylinder, the difficulty to start the motor "from cold," &c.—have thus far stood in the way of a general adoption of the practice.

A motor fuel, recently invented and patented and to which the name of "Natalite" has been given, is said to overcome the difficulty attendant upon the use of alcohol alone, by mixing with the alcohol ether obtainable by the distillation of alcohol with sulphuric acid.

A report made in June, 1915, by Professor Vivian B. Lewes, Chief Superintending Gas Examiner of the Corporation of the City of London, has been summarized in a recent issue of the *International Sugar Journal* (Vol. 18, 1916, p. 32).

In concluding his report, Professor Lewes said:—"The great value of 'Natalite' lies in the fact that alcohol can be made on an enormous scale in every quarter of the world, while the alcohol so made can be caused to give the necessary ether by further distillation with sulphuric acid, and the cost at which the finished spirit could be put upon the market would be considerably below the price of the cheapest petrol.

"There is not the least doubt that, given the required facilities, 'Natalite' would prove a motive fuel of the greatest Imperial importance."

—*Pure Products*, July, 1916.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.9.16	15.9.16 to 14.10.16	Total to Date (Six months).	Position in Competition.
	LIGHT BREEDS.					
	WET MASH.					
1	G. McDonnell	White Leghorns ..	620	152	772	1
10	J. H. Duncan	,, ..	607	153	760	2
13	H. J. Meaddows ..	,, ..	604	147	751	3
25	A. H. Mould	,, ..	595	145	740	4
36	E. W. Hippe	,, ..	586	144	730	5
7	C. J. Jackson	,, ..	600	128	728	6
40	A. Brundrett	,, ..	590	126	716	7
41	Excelsior Poultry Farm ..	,, ..	576	138	714	8
38	V. Little	,, ..	564	146	710	9
37	J. M. Smith	,, ..	557	150	707	10
22	Mrs. H. Stevenson ..	,, ..	574	132	706	11
28	S. Cheatle	R.C.B. Leghorns ..	556	134	690	12
15	G. Laughlan	White Leghorns ..	545	142	687	13
3	W. M. Bayles	,, ..	537	150	687	14
17	W. G. Swift	,, ..	552	133	685	15
44	J. Jamieson	,, ..	540	145	685	16
27	John Blacker	,, ..	574	105	679	17
24	Mrs. H. N. H. Mirams ..	,, (5 birds)	561	105	666	18
45	C. H. Oliver	,, ..	530	131	661	19
14	W. R. Hustler	,, ..	523	133	656	20
23	T. A. Pettigrove ..	,, ..	530	124	654	21
32	N. Burston	,, ..	499	149	648	22
30	F. T. Denner	,, ..	514	122	636	23
39	L. McLean	,, ..	499	137	636	
34	P. G. Silberelsen ..	,, ..	502	130	632	25
18	C. Ludwig	,, ..	502	128	630	26
12	G. Hayman	,, ..	478	146	624	27
11	R. W. Pope	,, ..	472	149	621	28
6	J. J. West	,, ..	486	133	619	29
16	F. Collings	,, ..	484	133	617	30
29	A. S. Hyndman ..	,, ..	465	149	614	31
26	Mrs. A. Dumas	,, (5 birds)	476	126	602	32
8	E. A. Lawson	,, ..	450	151	601	33
43	S. Buscumb	,, ..	447	150	597	34
101	A. E. Silberelsen ..	,, ..	452	143	595	35
19	Benwerren Egg Farm ..	,, ..	430	132	562	36
5	W. G. Osborne	,, ..	408	118	526	37
35	Tom Fisher	,, ..	363	130	493	38
20	H. I. Merrick	,, ..	362	131	493	
33	E. F. Evans	,, ..	345	139	484	40
9	W. H. Clingin	,, ..	353	129	482	41
4	Fulham Park	,, ..	290	149	439	42
31	J. H. Gill	,, ..	262	146	408	43
		Total ..	21,463	5,880	27,343	
	HEAVY BREEDS.					
	DRY MASH.					
98	Marvilla Poultry Farm ..	Black Orpingtons ..	670	125	795	1
97	D. Fisher	,, ..	621	115	736	2
100	Oaklands Poultry Farm ..	,, ..	611	123	734	3
94	Mrs. H. Coad	,, ..	515	104	619	4
95	Mrs. T. W. Pearce ..	,, ..	484	135	619	
96	H. Hunt	,, ..	418	124	542	6
99	J. Ogden	,, ..	313	84	397	7
		Total ..	3,632	810	4,442	

Sixth Victorian Egg-Laying Competition, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.9.16	15.9.16 to 14.10.16	Total to Date (Six months).	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
46	W. H. Robbins ..	White Leghorns ..	702	138	840	1
52	W. J. Thom ..	,, ..	653	161	814	2
59	T. A. Pettigrove ..	,, ..	675	135	810	3
53	W. N. O'Mullane ..	,, ..	616	154	770	4
58	C. Ludwig	,, ..	593	151	744	5
70	G. Wilkinson	,, ..	602	141	743	6
56	Mrs. Nicoll	,, ..	616	121	737	7
47	H. McKenzie and Son ..	,, ..	585	151	736	8
54	Mrs. A. O. Hughes ..	,, ..	566	152	718	9
65	Izard and Tierney ..	,, ..	570	142	712	10
61	C. C. Dunn	,, ..	573	123	696	11
62	H. W. Morrow	,, ..	554	132	686	12
69	E. A. Lawson	,, ..	505	152	657	13
55	Rev. J. Mayo	,, ..	502	150	652	14
48	Thirkell and Smith ..	,, ..	508	135	643	15
60	A. Greenhalgh	,, ..	490	134	624	16
67	Lysbeth Poultry Farm ..	,, ..	475	146	621	17
63	N. Burston	,, ..	452	158	610	18
49	C. Lane	,, ..	456	109	565	19
66	Benwerren Egg Farm ..	,, ..	401	154	555	20
51	Reliable Poultry Farm ..	,, ..	412	137	549	21
50	Clevedon Poultry Farm ..	,, ..	409	140	549	
64	A. Bennett	,, ..	359	140	499	23
66	W. G. Osburne	,, ..	311	141	452	24
		Total ..	12,585	3,397	15,982	
		HEAVY BREEDS				
		Wet Mash.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	720	139	859	1
89	Brooklyn Poultry Farm ..	,, ..	648	113	761	2
87	S. Buscumb	,, ..	625	124	749	3
85	Mrs. M. Coad	,, ..	609	124	733	4
92	J. H. Wright	,, ..	610	110	720	5
86	C. Lndwig	,, ..	597	119	716	6
80	Mrs. T. W. Pearce ..	,, ..	597	108	705	7
88	A. D. McLean	,, ..	579	123	702	8
83	L. McLean	,, ..	598	92	690	9
90	Excelsior Poultry Farm ..	,, ..	528	153	681	10
72	Marville Poultry Farm ..	,, (5 birds)	556	95	651	11
91	N. Papayanul	,, ..	506	143	649	12
93	L. W. Parker	,, ..	548	101	649	
78	Reliable Poultry Farm ..	,, (4 birds)	503	134	637	14
77	Mrs. G. E. Bald ..	White Plymouth Rocks	467	122	589	15
81	K. Courtenay	Faverolles ..	443	122	565	16
84	H. L. Trevana	Rhode Island Reds	414	121	535	17
71	C. E. Graham	Black Orpingtons ..	397	135	532	18
73	E. W. Hippe	Rhode Island Reds	411	102	513	19
76	L. A. Errey	Silver Wyandottes	392	119	511	20
82	J. Ogden	Black Orpingtons ..	340	129	469	21
75	Mrs. Drake	Rhode Island Reds	324	103	427	22
		Total ..	11,412	2,631	14.043	

REPORT.

The past month has been very trying for the birds, chiefly on account of the extremely heavy rainfall. For many days in succession heavy rain fell almost incessantly.

Broodies were very numerous during the month, up to 45 in one week.

The results may be considered satisfactory, in view of the unprecedented conditions, and with better weather the birds are now scoring well.

Rainfall, 824 points.

Temperatures: Lowest, 44 deg. Fahr.; highest, 78 deg. Fahr.

Department of Agriculture,
Melbourne, Victoria.

A. HART,
Chief Poultry Expert.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

SPRAYING.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray in a pump barrel that has not been washed out very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shot hole, and other fungus diseases must be kept in check. Various sprays are required for all of these troubles, and the necessity of always having a clean pump will thus be admitted.

At the present time the wisest spray for peach aphis will be strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. If the spraying is careful and thorough, no bandaging need be carried out. The time spent in bandaging will be far better employed in an extra spraying. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a good number of buds if this insect is sprayed. Nicotine solution, pine spray, or lime sulphur may be used with good effect.

Cultivation.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover, and if the orchard soil is at all heavy or stiff, the grower should make up his mind to grow a cover crop next season, in order that this condition may be reduced

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cutworm moths, &c.

General Work.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass or straw mulching, not too rich in animal manure.

The disbudding of unnecessary shoots and the pinching back or stopping of growths, to prevent them from being unduly prolonged, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, watering and mulching them after planting.

Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back, crowded bunches and shoots should be thinned, the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into flowering and lateral growths. Watch the plants for mildew, and use sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it may be well to dip the whole plant in water before planting. This greatly assists the young plants while taking hold of the soil in their new location.

Frequent waterings and frequent cultivation will now be necessary; and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladioli, tubers of dahlias, and seed of such tender annuals as phlox Drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos, and portulaca.

While seeds germinate and grow fairly well planted out in the open, it is more advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need only be on the one side, preferably the west or north-west; the seedlings are then protected during the hottest part of the day. At the same time the shading should not be sufficient to unduly "draw" them.

The seeds must not be deeply sown, and all waterings should be light. A little water, often, should be the rule for seedlings. Annuals require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have room to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias should now be planted out, either from tubers or from young rooted cuttings. These will give good summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for protection: included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or wind: the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

REMINDERS FOR DECEMBER.

LIVE STOCK.

HORSES.—*Stabled Horses.*—Over-stimulating and fattening foods should be avoided. Give water at frequent intervals. Rub down on coming into the stables overheated. Supply a ration of greenstuff, if available, to all horses, or bran mash once a week with 3 or 4 packets of Epsom salts. *Brood Mares.*—Those with foals at foot should be well fed. *Early Foals* may, with advantage, be given oats to the extent of 1 lb. for each month of age daily. Examine the region of the jaws, neck and forelegs for eggs or nits of bot-flies. If present destroy by running a singeing lamp lightly and rapidly over the affected regions.

CATTLE.—Provide succulent fodder and plenty of clean water and shade. Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron, ½ lb. Look out

for milk fever. Read up method of treatment in *Year-Book of Agriculture*, June, 1905. Have cows tested for butter-fat and weighed. Rear heifer calves from cows giving satisfactory results. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half-a-cup of limewater in the milk to each calf. Let them have a good grass run or lucerne, or ½ lb. crushed oats each per day in trough. Dehorn all dairy calves, except those required for stud or show purposes.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read articles on breeding and feeding in *Journals* for April, 1912, June, 1913, and May, 1915. Pig raising and fattening with present price of pollard and bacon should be highly profitable.

SHEEP.—Mate all ewes procurable. Where ewe lambs are held for future breeding see that the cross will result in bulky medium grade, good style fleeces as well as a roomy carcass. Allow rams to remain with the ewes seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. If conditions justify it, 3 and 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring an increased number of twin lambs. Clear wool and hurrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed or as near one cross as possible to ensure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. Ewes carry their lambs, four months, four weeks, four days, or roughly, five months.

POULTRY.—Add a little pearmeal to morning mash and give less bran. Feed equal parts wheat and heavy oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Discontinue salts and condiments. Avoid salt meat of any description. Put Douglas mixture in drinking water when required. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets. Hens will do better this month by having free range. Remove all male birds from flocks, as infertile eggs will keep longer and command a higher price.

CULTIVATION.

FARM.—Cut hay in late districts. Cut oats and barley in early places. Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

ORCHARD.—Keep the surface loose and free. Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

VEGETABLE GARDEN.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

FLOWER GARDEN.—Plant out dahlias and gladioli for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose. Keep rose beds fairly dry.

VINEYARD.—Inspect young grafted vines (field or bench) and carefully remove any scion roots. Tie up young vines. Beware of cut worms on young vines—See *Journals* for July, 1911, and September, 1913. Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain. Look out for oidium and repeat sulphurings on first appearance of disease.

Cellar.—Fill up regularly and keep cellars as cool as possible.

THE JOURNAL
OF
The Department of Agriculture
OF
VICTORIA.

Vol. XIV. Part 12. 11th December, 1916.

FRUIT PROSPECTS, 1916-17.

By P. J. Carmody, Chief Orchard Supervisor.

Unfortunately the prospects for the fruit crop for the coming season are anything but promising. The enormous crop of last year to a certain extent weakened the trees, and even under the best weather conditions a heavy yield could not be expected.

The unfavorable weather throughout the blooming period no doubt is the principal cause of the poor setting. While the mid-season apples were in bloom there were only two fine days in some of the largest apple districts. Under these conditions insect activity was at a minimum, and there was but little dissemination of pollen throughout the orchards through the influence of winds, so that one could but expect a very light setting of fruit.

Peaches and pears seem to have set satisfactorily in most districts, but all other fruits are considerably below normal yields.

It will be necessary to take precautions against the pests so as to secure the crop that is now in sight.

The Black Spot threatens to be bad, as when the time of spraying occurred the weather was so bad that it could not be carried out. It will, therefore, be advisable to give a spraying of lime and sulphur at a strength of about 1 in 30 as soon as possible to prevent this extending.

Subjoined are the reports of the orchard supervisors in their respective districts:—

Prospects of fruit crop for season 1916-17 in the district which comprises the following places:—Arthur's Creek, Cottle's Bridge, Diamond Creek, Doreen, Eltham, Greensborough, Hurstbridge, Kangaroo Ground, Kinglake, Keilor, Panton Hill, Queenstown. Research, 15013.

Streamville, Strathewen, Tanck's Corner, Wallan, Whittlesea. E. Wallis, Orchard Supervisor—

Apples.—Light.
Apricots.—Not grown to any extent, except at Keilor, where crop promises to be medium.
Cherries—Medium.
Peaches—Heavy.
Pears.—Medium to heavy at majority of places. Setting of some varieties interfered with by rain.
Plums.—Medium to heavy.
Quinces.—Medium to heavy.

Prospects of fruit crop for season 1916-17, in the Doncaster district. A. H. Hammond, Orchard Supervisor—

Apples.—Very light. Old trees that bore heavily last season have little or nothing on this season. Young trees and trees that were thinned and irrigated are carrying a light to medium crop. Taking the district as a whole, the apple crop will not be more than 15 to 20 per cent. of last season's crop.
Apricots.—Medium. Not largely grown.
Cherries.—Light. The early cherries are patchy; some orchards have a very fair crop, others very poor. Mid-season cherries are mostly a failure. Late cherries are also very poor. I should judge that the crop will not be more than 15 per cent. of the normal yield.
Peaches.—Very good. All varieties are carrying a heavy crop, and will require thinning.
Pears.—Heavy. All leading varieties have set a heavy crop. Owing, however, to the Black Spot (Fusicladium), the quantity of marketable fruit will not be more than normal, and perhaps less. Much depends on the efforts now being made to cope with the disease.
Plums.—Light. The crop of plums is very poor. Japanese plums in the Wandin district are medium; Angelina and Black Diamond are patchy. The plum crop, like the cherry, was spoiled by the continuous heavy rain when in full bloom.
Quinces.—Medium.

Prospects of fruit crop for season 1916-17 in the Evelyn and Central districts. J. Farrell, Orchard Supervisor.

Owing to the continual heavy rains, accompanied by low temperatures, which prevailed during the period in which the trees were in bloom, it is estimated that the crops of large fruits particularly, except pears, will be considerably below the average.
Apples.—Of the early blooming varieties Jonathan shows best; even then the crop will be light. The late blooming varieties—Five Crown and Rome Beauty, &c.—look well in places, but they are not setting as well as might be expected.
Pears.—Williams' Bon Chretien, medium to heavy; Howell, Beurre Bosc, Beurre Capiaumont, Vicar of Winkfield, medium; others, medium to light.
Plums.—All varieties light to very light, even the Japanese, which usually set well.
Cherries.—Early varieties very light; late sorts light.
Apricots.—Oullin's Early and Moorpark, medium; others, medium to light.
Peaches.—In some parts of the district all kinds a fair crop; in others, medium to light.
Quinces.—Mostly light.
Figs.—First crop light.
Passion Fruit.—Although the vines do not look as well as they usually do at this time of the year, a good crop is in evidence.
Loquats.—Very light.
Lemons.—Medium.
Oranges.—Medium to light.
Gooseberries.—Medium to light, even the Roaring Lion, which usually yields so well.
Currants.—White, light; black, medium.

Raspberries.—It is rather early to estimate, but as the canes look well, and in the absence of thrip, a medium crop may be expected.

Loganberries.—These look very well, and will probably yield a good crop.

Blackberries.—Calculation on the same basis as for Raspberries and Loganberries.

Strawberries.—The weather has been too wet and cold for the plants to properly develop their blooms. In all probability there will be a fair crop, but it will be later than usual.

Prospects of fruit crop for season 1916-17 in the districts mentioned below. A. G. McCalman, Orchard Supervisor—

GEELONG DISTRICT.

Apples will be a light crop. Jonathans in many cases failed to bloom, and where there was bloom did not set well. Reinette de Canada, Stewart's Seedling, Granny Smith, and Munro will be on the light side. Delicious, Dumelow Seedling, Thorle Pippin, Yates' Seedling, Emperor Alexander, and Shockley will be light. King David failed to bloom. Sturmers are setting well, and so is Cleopatra. Æsopus Spitzenburg is a failure.

Apricots will be on the light side; only a few orchards which were irrigated last season, or where the crop failed from frost, show a heavy setting. Moorpark and Mansfield Seedling will be medium to light, and Turkey very light.

Plums.—Nearly all varieties of plums have set very light crops, the weather at the time of blooming being very unfavorable, besides which the bulk of the trees bore very heavy crops last season.

Cherries.—Early varieties will have a medium crop, but St. Margarets and Florence will be very light.

Pears.—Most varieties, including Williams', Black Achan, Beurre de Capiaumont, Josephine de Malines, Winter Cole, and Beurre Clairgeau have set good crops.

Quinces and Gooseberries have set fair crops.

Peaches.—All varieties have set well.

MT. COLE DISTRICT.

Apples will be a light crop. London Pippin, Rokewood, Stone Pippin, and Munro are a failure; Jonathan and Rome Beauty and other varieties are light.

Pears, including Williams', Vicar of Winkfield, and Josephine de Malines will be light.

Apricots are very light, and *Peaches* will be a failure from frost.

Cherries will be a medium crop.

COLAC DISTRICT.

Apples will be a light crop. Rome Beauty promise well, but most varieties will be light.

Pears will be a good crop, Williams', Kieffer's Hybrid, and Packham's Triumph showing well for fruit.

Plums will be a medium crop, and early *Cherries* fair.

Currants and Gooseberries will be light, and *Raspberries* fair.

ROKEWOOD JUNCTION DISTRICT.

Apples will be light. Rokewood is very light; Jonathan, light. Northern Spy, Sturmer, and Cleopatra promise well, as do Rymer, Hoover, and London Pippin. Dumelow and Spitzenburg are a failure.

Pears, including Williams', Kieffer, Vicar of Winkfield, and Josephine will be a good crop.

Early *Cherries* are good, but late kinds light. About Linton both early and later varieties of cherries set well.

BALLARAT DISTRICT.

About Buninyong Cherries will be a light crop, but Early Purple Guigne set well, and Bedford's Prolific set a fair crop. St. Margaret and Florence are very light. Apples will be very light, though Rymer's are fair and Rome Beauty promise well. Plums and Quinces are fair, and Gooseberries light. Raspberries promise well.

PANMURE DISTRICT.

Apples are a light crop. Most of the Cleopatras failed to bloom. Jonathans are light, but Rome Beauty promises well.

Pears, including Williams', Kieffer's, Beurre de Capiaumont, Marie Louise, Josephine, Vicar of Winkfield, and Gansell's Bergamot set heavily.

Cherries are heavy.

Plums did not bloom well and set badly, so will be very light.

SUMMARY.—Apples will be light. Apricots, medium. Pears, fairly heavy. Cherries, light. Plums, very light. Peaches, heavy. Quinces, fair. Gooseberries, fair. Raspberries and Currants, fair.

Prospects of fruit crop for season 1916-17 in the Gippsland district. L. Pilloud, Orchard Supervisor—

The apple crop is very light in orchards inspected at Beaconsfield, Officer, Pakenham, Gembrook, Garfield, Nar-Nar-Goon, Drouin, Warragul, Rokeby, Darnum, Yarragon, Cowwarr, and Bairnsdale. Jonathans, Yates, Sturmers, Rymers, London Pippins, and Rome Beauty are very light. All other varieties set, only a few here and there.

Pears.—Williams', Kieffer Hybrid, Josephine, Gansell's Bergamot, heavy crop; other kinds, light.

Plums.—Good all over district.

Cherries.—Good.

Quinces.—Very light.

Apricots.—Good crop.

Peaches.—Good crop at Bairnsdale, Bruthen, Cowwarr, Warragul, and Drouin.

Prospects of fruit crop for season 1916-17 in the Goulburn Valley district. G. M. Fletcher, Orchard Supervisor—

Peaches.—All varieties of both canning and dessert promise a heavy crop in all parts of the district.

Apricots.—Young, vigorous trees show good crops, but the old trees are very light. Shot Hole has made havoc with the old trees, and thinned the crop very severely. Owing to the excessively wet season only a minimum of spraying could be done to combat the disease. In different parts of the district one variety is better than all the others, but in other districts other varieties show better. I estimate only a half crop, with no particular variety prominent.

Pears.—Williams' constitute the bulk of the trees grown. These blossomed during the wettest spell, and the setting is very light. Individual orchards at odd places show a good crop, but the whole will be very light. Winter Nelis are almost a complete failure. Gansell's, Josephine, and Bosc are only grown in comparatively small quantities. The crop from these is much better than that of the Williams'.

Nectarines.—All varieties very good.

Prunes and *Plums.*—Light and patchy.

Grapes promise a heavy crop.

Apples.—Few grown; crop patchy and light.

GENERAL.—Early and late blooming varieties of all fruits promise well. Any that bloomed in the wet spell of September are a failure. Black Spot is showing up in some vines, and if checked will not affect the crop. Irregularity or inconsistency is a big feature in all crops, except peaches, in all parts of the district. Neighbouring orchards show widely differing results in the same varieties.

Prospects of fruit crop for season 1916-17 in the following districts W. P. Chalmers, Orchard Supervisor:—

HORSHAM, QUANTONG, RIVERSIDE.

Apples, light. Pears, good. Early Peaches, heavy. Late Peaches, good. Apricots, fair. Plums, good. Prunes, fair. Almonds, fair Cherries, light. Figs (first crop), fair. Grapes, heavy.

DAYLESFORD, CLUNES, TALBOT.

Apples, light. Pears, good. Plums, light. Gooseberries and Currants, fair.

AMPHITHEATRE, ELMHURST, EVERSLEY.

Apples, very light. Pears, light. Apricots, good. Plums, light.

DUNOLLY, BET BET, ST. ARNAUD.

Apples, good. Pears, heavy. Early Peaches, heavy. Late Peaches, good. Apricots, good. Plums, light. Almonds, light. Cherries, light. Figs (first crop), very good. Grapes, heavy.

STAWELL, POMONAL.

Apples, light Pears, heavy. Late Peaches, good. Apricots, light. Plums, light. Cherries, fair. Grapes, heavy.

Prospects of fruit crop for season 1916-17 in the Mildura district. G. H. B. Davidson, Orchard Supervisor—

Citrus.—Blossomed well, and there should be heavy crops of these, with the exception of the trees affected with the salt water.
Peaches.—There should be heavy crops both at Mildura and Merbein.
Apricots.—Early varieties good; others light in some blocks and fair in others. On the whole they are not as good as last year.
Pears.—Heavy in most of the blocks.
Plums.—Good, Prunes showing good crops.
Figs.—First crop fair.
Almonds.—Good.

Prospects of fruit crops, season 1916-17, in the North-Eastern district. C. F. Cole, Orchard Supervisor—

Peaches.—Throughout the district, heavy to medium.
Plums.—Most varieties, good average crop.
Apricots.—Light.
Almonds. Medium.
Cherries.—Medium to light.
Figs promise to be a heavy to medium crop.
Quinces.—Medium to heavy.
Oranges and *Lemons* in most localities promise well.
Pears.—Medium to light in most districts. Williams' promise to be the heaviest cropper this season.
Apples.—Medium to light generally. *Jonathans* and *Cleopatra* heavy in places. In late districts Apples are blooming well, and promise a medium crop.

Prospects of fruit crop for season 1916-17 in the Northern district. S. A. Cock, Orchard Supervisor—

The fruit crop in the Northern district promises to be light. Owing to the abnormally wet season it is almost impossible at present to forecast the crop with any degree of accuracy. Taking the various centres of the district—Castlemaine, Bendigo, Echuca, and Swan Hill—the following will show how the crop is at present:—
Apples.—Light crop
Apricots.—Medium crop.
Almonds.—Heavy crop.
Cherries.—Medium crop.
Citrus Fruits.—Promise very heavy crop.
Figs.—Light crop.
Grapes.—Promise very heavy crop.
Pears.—Light to medium crop.

Peaches.—Medium crop.
Plums.—Medium to heavy crop.
Quinces.—Heavy crop.
Tomatoes.—Medium crop. Floods and heavy rain have proved disastrous to early crop.

Prospects of fruit crop for season 1916-17 in the Portland district. T. J. Smith—

Apricots.—Medium; not many grown.
Pears.—Principal varieties—Vicar, Williams' Bon Chretien, Black Achan, Josephine, Buerre Bosc, Capiaumont, Clairgeau, Broom Park—immensely heavy crop.
Apples.—Jonathan, Gravenstein, Munro's, Rome Beauty, Rokewood, Sturmer, Cleopatra, Stewart's, Stone Pip, Spy, Æsopus, Ben Davis, Five C., Alexander—in all cases these are very light to medium.

Prospects for fruit crop for season 1916-17, South-Eastern district. E. Meeking, Orchard Supervisor—

Apples.—Jonathan, the principal variety grown on the Mornington Peninsula and South-Eastern Gippsland, is, on the whole, from light to medium: in no one centre is there a heavy crop. Heavy rain at a critical time interfered with the setting, and it was also the off year for many trees. Reinette, very light: in some districts practically *nil*. Sturmer, medium to heavy. Pomme de Neige, very light. Statesman, light. London, light. Rome Beauty, light. Yates, light. Munro, medium. Alfrieton, very light. Gravenstein, light. Stone Pippin, medium. Rokewood, light. Williams' Favourite, medium to heavy. Æsopus, medium to heavy.
Pears.—Williams' Bon Chretien, heavy. Kieffer's Hybrid, light to medium. Beurre de Capiaumont, light to medium. Broom Park, heavy. Beurre d'Anjou, light to medium. Beurre Clairgean, light to medium. All other varieties, light to medium.
Apricots.—Moor Park, light to medium. All other varieties, light.
Plums.—All ordinary varieties, light to medium. All Japanese varieties, medium to heavy.
Cherries.—Light varieties, medium. Dark varieties, medium.
Strawberries.—All varieties, a full average crop.
Quinces.—All varieties, heavy.
Peaches.—All varieties, light.

"THE WORLD'S AMMONIA."

The world's annual production of sulphate of ammonia from ordinary sources before the war was approximately 1,200,000 tons. In the United Kingdom the consumption has increased from 50,000 tons in 1897 to 130,000 tons in 1915, an increase which is very largely attributable to the efforts of the Sulphate of Ammonia Association, and which is certainly reflected in the remarkably remunerative prices obtained. The exports in the same period increased from 153,000 tons to 205,000. These figures are taken from an article in the "Iron and Coal Trades' Review" by Mr. Bayley, who adds that these totals may appear somewhat insignificant in comparison with what is done in Germany. Before the war the consumption in Germany approached 500,000 tons. The future position of sulphate of ammonia seems to be more doubtful than hitherto, and Mr. Bayley suggests that renewed and novel effort should be made to stimulate consumption in the United Kingdom.

APPLE CULTURE IN VICTORIA.

(Continued from page 666.)

By J. Farrell, Orchard Supervisor.

Pruning Established Trees.

Now that the principles are shown under which the modern type of fruit tree may be established in accordance with the plans which are submitted for consideration, the pruner should carefully note all the details with a view to their future scientific application.

Owing to the varying conditions under which the pruner has to work, it is not suggested that in every instance the trees can be brought to the state of perfection depicted in the plan and side elevation.

The leader growths multiply freely when the tree is growing on rich land, whereas one on poor soil requires more careful and systematic nursing in order to obtain the progressive leader duplication required. To be successful in this regard, however, it is essential that the operator should have fixed in his mind at the start the plans of the type of tree he wishes to establish.

When weak two-year-old trees are planted out on poor soil, the head growths should be cut hard back to outer buds with a view to producing strong single leaders, as leader duplication is rarely obtainable during the first year after planting under the adverse conditions mentioned. When the strong single leaders desired have been secured in this manner they may be cut hard back to side buds at next pruning, after which, owing to root establishment supplemented by manuring and good cultivation, the two leaders desired from each cut will result.

Having strengthened up the crown or foundation of the branch system in this way the pruner may continue to duplicate the leaders until such time as the desired number are obtained, and as shown in the plan Plate 35.

The main objects of pruning a fruit tree are to stimulate root action, to produce and maintain the required number of well-selected and nicely-spaced leaders which should be clothed from the top to their base with the proper quantity of fruit spurs of good quality, and a liberal supply of light fruit-producing lateral growths on the varieties that require them. Regular systematic pruning also maintains an equilibrium of strength between the root and branch systems. The free access of sunlight and air to all parts of the tree and to the fruit is provided for. The tree's symmetrical appearance, stability, and uprightness through its leaders radiating from the crown at a suitable angle to the vertical is ensured. And finally, its pruning is simplified, spraying and fruit picking is facilitated, cultivation is cheapened, while the quantity of the fruit product is increased and its quality improved.

The Established Tree.

When a tree has received its annual winter pruning, from the time of planting until it is seven years old, and provided the plans laid down for the guidance of same have been followed as closely as the conditions

governing the growth of the particular variety will permit, it will in most cases have assumed the shape of the Emperor Alexander tree shown in Plate 38.

It will be observed that this tree was rather difficult to manage owing to the main arm on the left being stronger than the others. But the judicious cutting practised in its case eventually produced a well-

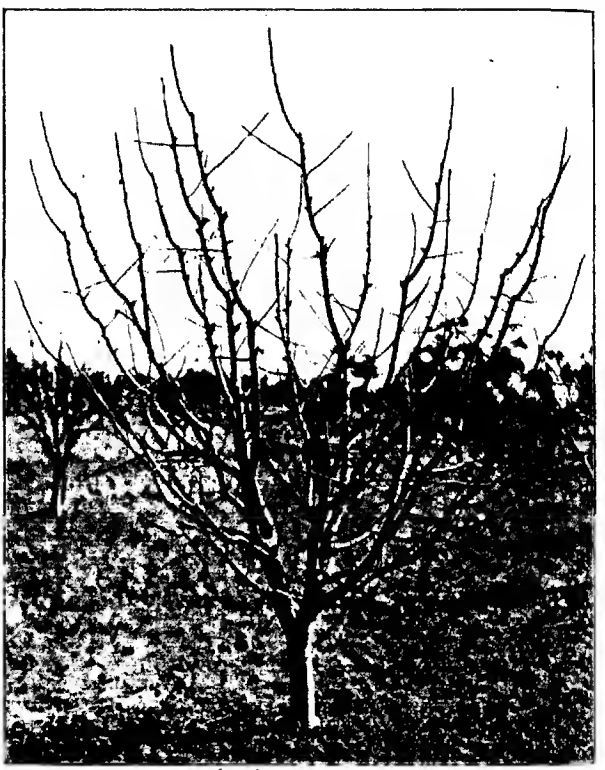


Plate 38.—Emperor Alexander, seven years old, and established on modern lines.

balanced branch system, and with its open centre and short stem this is a typical specimen of the modern apple tree.

It is growing on fairly deep, rich, well-drained and thoroughly cultivated silurian soil, and, as usually happens, when these favorable environments attend the growth of a tree, it is healthy, vigorous, thrifty, and of fruitful character.

After the desired number of leaders were obtained, no further duplication of same was permitted, and at the annual pruning the light laterals were retained to clothe the leaders with a desirable class of fruitful wood, while the stronger and less fruitful ones were completely suppressed.

The removal of the strong growths enables the fruit buds on the two-year-old wood of the leaders to extend into natural permanent fruit spurs, and when the light laterals have set up their fruit buds during the second year of their growth, they are shortened back to a few inches

Plate 39.—Tree showing fruit on short growths along the leaders.

in length, and practically converted into strong artificial spurs to supplement the fruit bearing capacity of the natural ones.

The object of this treatment is to ultimately produce a tree which will carry its fruit on short growths along the leaders like that shown in Plate 39. At the next winter pruning all the strong young growths appearing at the points of the leaders of this tree as a result of last year's cuts should be removed except one in each case which is retained to continue the straight single leaders. The length at which these leader growths should be cut may be determined by the class of soil on

which the tree is growing and by the strength of the growths it is producing. Strong growths may be cut longer than the weaker ones. As a guide in this matter, however, from a minimum of 6 inches to a maximum of 12 inches may be observed as a standard, when a tree over seven years old is growing on soil of average fertility. When the tree is under seven years old and growing under similar conditions the standard may be raised somewhat when dealing with the leaders after the discontinuance of their duplication and until the tree has reached the age of seven years. When this open formation of the tree has been obtained and the fruit encouraged to develop along the leaders as depicted, through the method of pruning advocated, sap elaboration in the leaves becomes perfected through the free admission of sunlight to the foliage. By the same agency the fruit attains its perfect colour, and its uniformity of size is regulated by the careful selection of the light laterals and spurs, of equal strength, on which it is grown.

Some trees, such as Jonathan, Æsopus Spitzenburg, London Pippin, and others which yield the dessert varieties, while young and particularly when cultivated on rich soil, frequently produce fruit of too large a size to carry its full commercial value. When establishing the branch systems of such varieties under the favorable conditions mentioned, the pruner should provide for a greater number of leaders and more fruit-bearing wood than would be required under normal conditions in order to regulate the fruit to a marketable size. The surplus leader and lateral growths may be removed when the tree has assumed its fruit-bearing habit and settled down to normal conditions.

These precautions are not necessary when dealing with the varieties which yield large culinary fruit, as this is mostly retailed in larger parcels than the dessert varieties and its keeping qualities are not so easily impaired.

Then there are the varieties like Yates and Pomme de Neige, which, no matter how favorable the conditions surrounding their growth, rarely yield fruit above the dessert standard, but often when grown on rich land, produce rank and over-vigorous leader and lateral growths which it is often difficult to control. When establishing these also, extra leaders and laterals may be retained until such time as the tree becomes fruitful and amenable to control by pruning in the ordinary way, when they may be removed.

The thirteen-year-old Reinette de Canada tree shown in Plate 40 may be taken as an illustration of this method of preventing the too vigorous growth of the leaders by their excessive duplication while young. As the fruit shows a tendency to become small, and when the wood growths assume normal dimensions the surplus leaders and laterals may be gradually removed according to requirements to be judged by the pruner.

Shortening Back the Leaders.

It will be understood that the leaders of a tree when about twelve years old will have become too long to satisfactorily support their fruit. In fact the leaders frequently break down under the weight of the fruit during years of heavy crops and particularly if the fruit is encouraged

Plate 40.—Reinette de Canada, thirteen years old.

Plate 41.—Lemon Pippin, fourteen years old, with leaders shortened back.

to develop on long laterals near their points. Plate 40 is also a specimen of this type of tree. To prevent this excessive lengthening of the leaders, however, they should be cut back occasionally to light and the more suitable laterals on the two, or three-year-old wood, and those laterals utilized to extend the stiffened leaders which will be made shorter as a result of this treatment. This method also maintains the tree's symmetrical appearance.

When the trees are pruned in the ordinary way and when the leaders have extended beyond a reasonable length, some pruners shorten them

Plate 42.—Rome Beauty, thirteen years old, with leaders shortened back.

back by cutting in the internodes of the three or four-year-old wood like the fourteen-year-old Lemon Pippin tree shown in Plate 41. This method is to be deprecated as the gradual upward flow of the sap is prevented, and it gives the tree a stunted appearance.

The best method to adopt in a case of this kind is to cut back to light laterals like these on the Rome Beauty, Plate 42, when they are conveniently placed on the three or four-year-old wood. By this means the gradual upward flow of the sap is permitted, and the leaders are encouraged to again extend from this point with the least possible interruption.

Pruning of the Rome Beauty.

Before essaying the task of establishing and subsequently pruning an apple tree on modern, scientific and commercial lines, it is essential that the pruner should, as far as possible, make himself acquainted with all the characteristics pertaining to the wood growths and with the

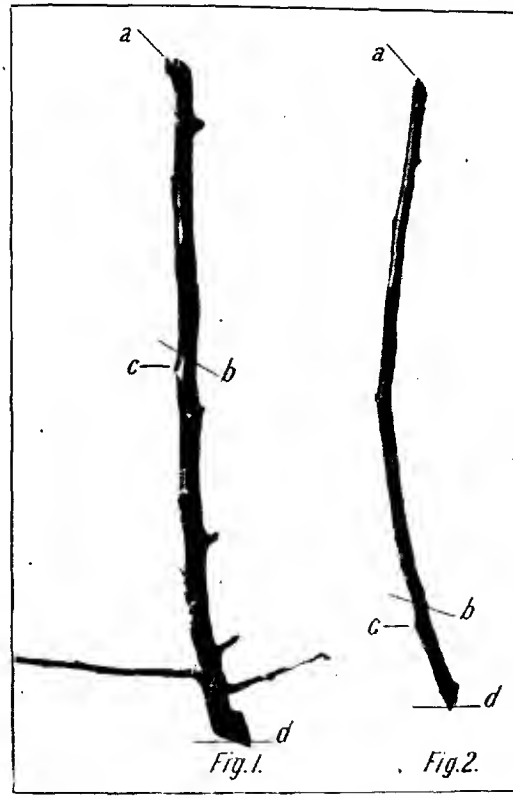


Plate 43.—Rome Beauty yearling leader growths.

continually varying soil, climatic and other conditions under which he is called upon to treat the individual varieties.

The Rome Beauty, particularly when grown on rich soil and owing to its habit of producing long barren leader and lateral growths, especially while it is young, is one of the varieties which is most difficult to bring to perfection, from the pruner's point of view. This is a

matter upon which most practical fruit-growers and pruning experts agree. For this reason the writer has specially selected the Rome Beauty as the first variety to be dealt with, and the detailed treatment recommended in its case is submitted for the consideration of the reader.

When all the details essential to the establishment and maintenance of this variety as a modern type of tree have been mastered, it will be observed that the shaping of other varieties more amenable to pruning treatment will have become an easier matter. The pruner will then have a confidence in himself which he did not hitherto possess.

The Rome Beauty, particularly while under five years of age and making strong wood, produces two classes of leader growths like these depicted in Plate 43. Both specimens were taken from the same three-year-old tree. They are one-year-old, and were cut at their base (*d*) from the two-year-old wood. Fig. 1 may be classed as fertile wood because it contains well-developed buds. Fig. 2 may be classed as barren because its buds are undeveloped and dormant.

When pruning Fig. 1 it should be cut as shown and bud (*a*) induced to continue the leader extension. Then the buds between (*a*) and (*d*) will almost invariably send out short light laterals of a fruitful character. But if cut at (*b*) and the leader encouraged to extend through bud (*c*) the buds between (*c*) and (*d*) will give out long, strong laterals of an unfruitful character. The pruner must judge from his experience the distance of the outer bud above (*d*) to which he is to cut in order to obtain the number and strength of the laterals he desires.

If Fig. 2, the barren growth, is cut as shown the leader will continue from bud (*a*), but, as almost invariably happens, no growths are produced by the dormant buds between (*a*) and (*d*). This is the reason why portions of barren leaders frequently appear in Rome Beauty trees. In order to obviate this, however, the leader should be cut at (*b*) when a strong growth containing well-developed buds will result during the next period of growth. Although all the buds along this growth are dormant, yet, an extension of the leader may be secured by cutting to any one of them. When the strong fertile growth has been obtained through the method of treatment described it may be cut long at next pruning so as to compensate for the barren wood removed.

When establishing a tree of this variety the primary object of the pruner should be to eventually construct one with leaders, and carrying their fruit wood like those shown in plates 34 and 42. When this method of scientific pruning is not practised, this variety produces long willowy growths and mostly carries its fruit on the points of the laterals. This deprives the tree of its symmetrical appearance and practically renders it unmanageable, especially when the leaders are kept hard pruned, and while they are making strong wood.

Plate 44 also depicts Rome Beauty leaders. Fig. 1 (*a*) to (*b*) is two-year-old barren wood pruned too long last year, but showing yearling wood with well-developed buds above the (*b*) cut. This should have been pruned at (*c*) and the young growth produced from (*d*). This specimen may be next pruned (*e*) and allowed to extend from (*f*). Fig. 2 is a strong fertile growth which may be pruned at (*a*) to enable (*b*) to produce the leader extension. Fig. 3 is a vigorous barren growth which if cut (*c*) and allowed to extend from (*d*) will be the wrong

method. It should be pruned at (*a*) and extended from (*b*). Fig. 4, (*a*) to (*b*), is three-year-old barren wood, which was pruned short last

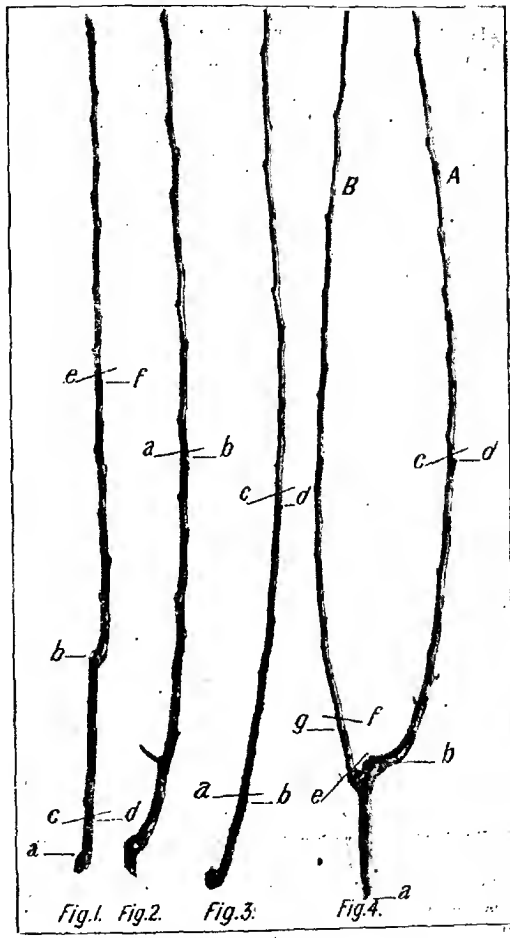


Plate 44.—Rome Beauty leader growths.

year into the two-year-old wood at (*b*). As usually happens when two growths are produced on this class of wood, a fertile leader (A) was

sent up from the terminal bud, and a barren one (B) from the bud immediately beneath it. Should (A) be retained as the leader it may be cut (*c*) and allowed to extend from (*d*), at next pruning, when (B) may be removed at (*e*). But should it be decided to retain (B) it may be cut (*f*) and lengthened from the (*g*) bud.

It has been previously stated that an angle of 40 degrees from the vertical is a suitable one to which to train the leaders. When they

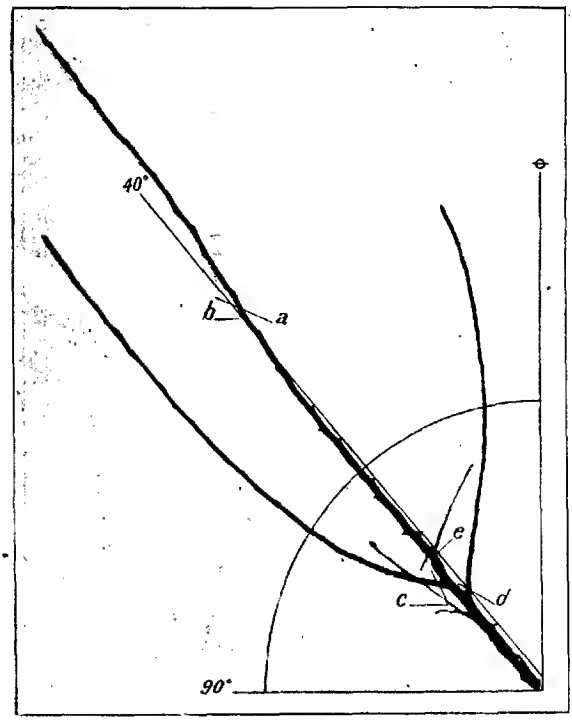


Plate 45.—Pruning the leader when it grows at a suitable angle to the vertical.

assume this position as shown by the one in quadrant in Plate 45, it is pruned as depicted. It grew from last year's cut (*e*), and should be next cut (*a*) to the outer bud (*b*) so as to continue the leader on the 40 degree line. The two strong barren growths may then be removed at (*c*) and (*d*), and the lighter ones are retained.

Varieties with strong upright habit of growth frequently require different treatment. Plate 46 shows same leader in a more upright

position in the quadrant, and with its outer barren growth on the 40 degree line. If it is desired to maintain the correct angle this growth should be made to assume the leadership by cutting it at (*a*) to the dormant bud (*b*). Then the other two strong growths may be removed by cutting at (*c*) and (*d*). In pruning upright growers like the States-

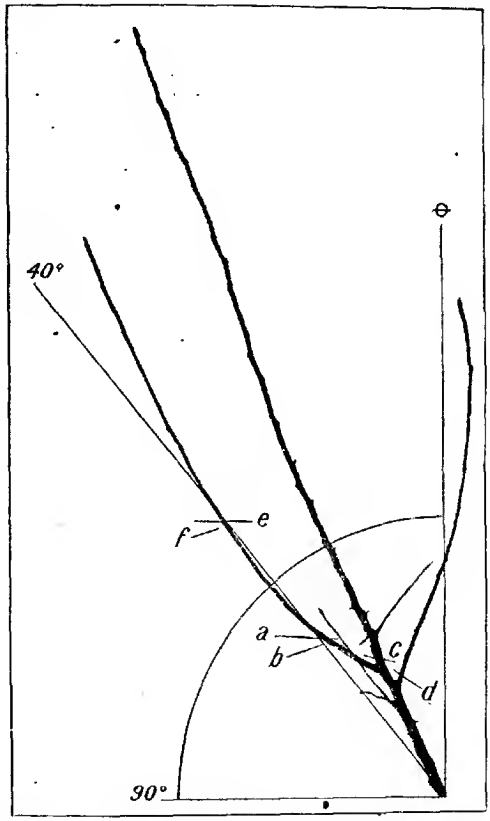


Plate 46.—Pruning the leader when it grows at an unsuitable angle to the vertical.

man, which produces well-developed buds upon all their growths, they may be cut (*e*) to buds corresponding with (*f*) in order to secure a more reasonable length of leader annually.

Plate 47 shows two unpruned Rome Beauty leaders, and the letters (*d*), (*c*), (*b*) and (*a*) represent in each case, the points at which the

annual cuts were made, and above which the portions of wood are one, two, three, and four years old respectively.

When Fig. 1 was cut at (*b*) it should have been pruned at (*e*) and in all probability a fertile growth would result from bud (*f*).

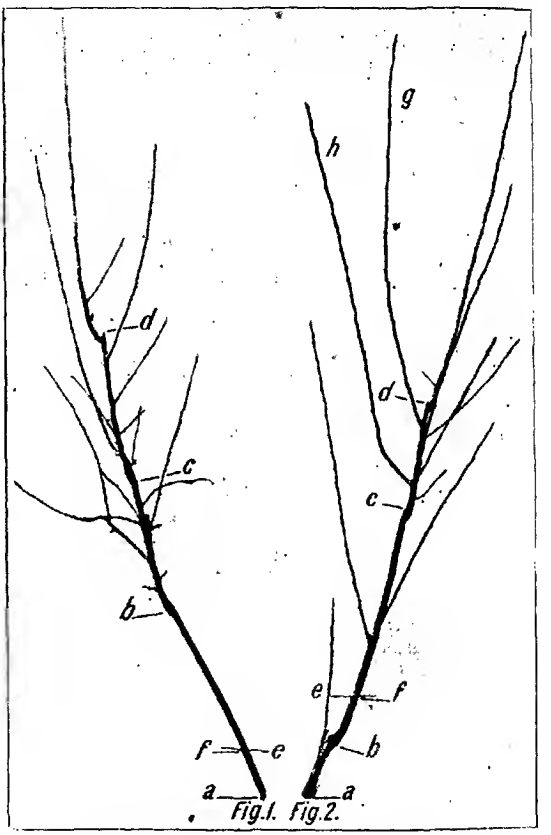


Plate 47.—Rome Beauty leaders unpruned.

When pruned at (*c*) and (*d*) the lengths of fertile wood were nicely gauged, and a suitable number of fruitful laterals were obtained as a result of these cuts.

Fig. 2, (*a*) to (*b*), is barren wood four years old. It was cut correctly at (*b*) when one year old, but a partly barren growth was the result.

Instead of cutting this at (*c*) it should have been pruned at (*e*) and made to extend from the (*f*) bud. Then the next year the (*d*) cut was made too close to (*c*), and consequently the strong barren laterals (*g*) and (*h*) were produced. At next pruning it is necessary to completely suppress these, and shorten back the lighter ones.

Plate 48 shows the same leaders pruned in the manner recommended under the circumstances.

Fig. 1 is a good type except for the barren portion, as it carries nice fruit laterals above that point.

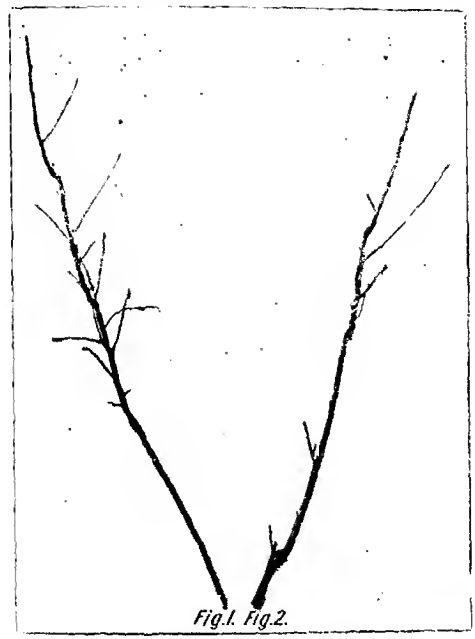


Plate 48.—Same leaders pruned.

Fig. 2 is not as good a specimen, because not only was the barren three-year-old wood cut too long, but the two-year-old wood was cut much shorter than its strength warranted. This necessitated the removal of the strong laterals which it produced, because if short portions of these are retained they usually reproduce strong growths. Frequently this, like other varieties, develops latent buds at the base of the strong laterals. When the laterals are removed these buds send out light short growths, which may be utilized to clothe the leader with a suitable quality of fruit wood.

Treatment of Rome Beauty Laterals.

Now that the structural formation of the Rome Beauty tree generally and the individual treatment of its leaders have been dealt with, the reader's attention is directed to the system of pruning advocated in connexion with the various types of lateral and spur growths which appear on this variety.

It has been stated that two classes of leader wood are produced by this variety, viz., fertile, and barren. This remark also applies in the case of the laterals.

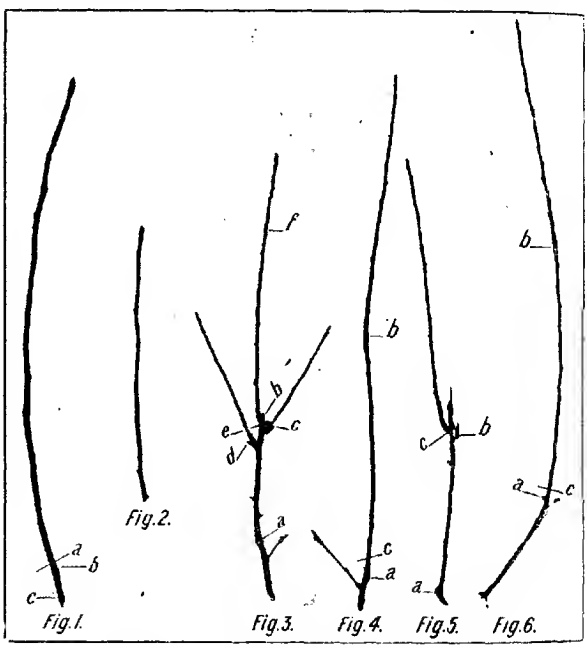


Plate 49.—Treatment of Rome Beauty laterals.

Plate 49, Fig. 1, is a strong barren yearling growth which, when it appears on the two-year-old leader wood, and particularly if it is near the base of the yearling extension, should be completely removed at winter pruning. But when produced on the barren portion of a leader it may be converted into a better class of fruit wood by duplication. To do this, cut at (*a*) so that the buds (*b*) and (*c*) may produce weaker growths like those on the barren leader between (*b*) and (*c*), Plate 47, Fig. 2. Should the resultant laterals be again too long and unfruitful

prune them as shown in Plate 48, Fig. 2, and continue this method until fruitful wood is developed. Fig. 2 is a one-year-old short lateral which,

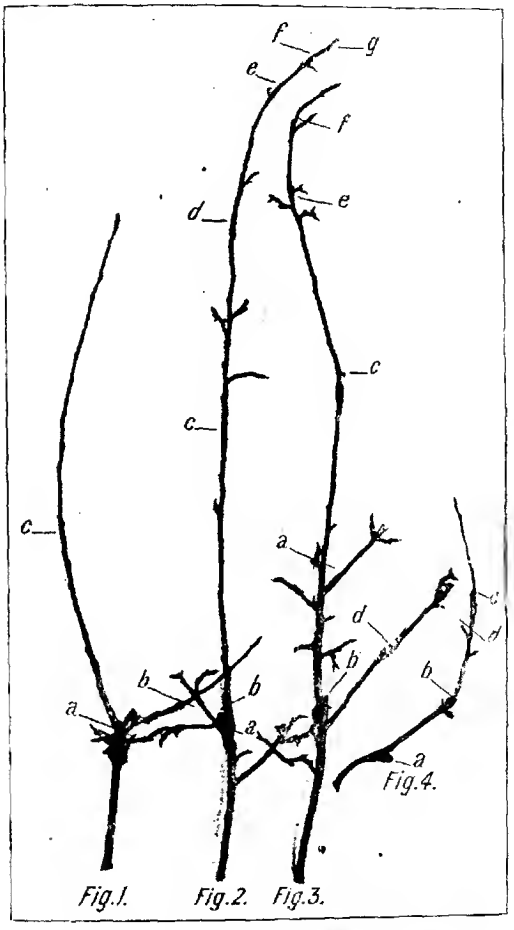


Plate 50.—Older Rome Beauty laterals unpruned.

although it has dormant buds except the terminal one, may be retained. Next year it will fruit on the terminal bud and a small growth or two

may be sent out from that point as well. Fig. 3 is three year old, and when cut at (*a*) in the yearling barren wood it gave out a fruitful growth, which, when pruned (*b*) the following year sent out the (*f*) shoot. It fruited on the buds (*c*) and (*d*), and produced two small growths from these points as well. To keep this growth fruiting near the leader prune it at (*e*) in the two-year-old wood next year. The weak laterals, if they fruit on their points and send out extensions next year, may be shortened back similarly at next pruning. Fig. 4, when cut at (*a*) in the yearling barren wood, sent out an equally barren growth to (*b*), but the following year, instead of fruiting on the terminal bud, a growth with well-developed buds was produced. As this fruitful wood is too far removed from the leader, the whole lateral should be removed by pruning at (*c*), in order to develop the two buds below that point and to strengthen the small growth appearing there.

Fig. 5, like Fig. 4, when pruned at (*a*) in the barren wood, gave out a partly barren growth during the next year. This fruited on the bud (*b*) during the succeeding year, and sent up an unfertile growth from the bud above it. To prune this specimen cut at (*c*) as shown in order to strengthen the partly developed fruit buds below that point. Fig. 6 is also three-year-old wood from the leader. It grew to (*a*) the terminal bud during the first year, fruited on this bud, and sent up the barren portion to (*b*) during the second year. During the third year the portion from (*b*) to the point which is fruitful was produced. This specimen should be pruned like (*c*) in order to develop the fruit buds between this point and the leader.

Plate 50 shows four Rome Beauty laterals of the class which usually appears on old trees of this variety, the pruning of which has been partly neglected or imperfectly executed. A neglected tree carrying this class of fruit wood may be renovated by shortening back the laterals as depicted in the illustration.

Fig. 1 was bearing its fruit on spurs below (*a*) until two years ago, when it gave out the barren growth (*a*) to (*c*), which was continued from (*c*) upward last year. To regulate this specimen cut at (*a*) and (*b*) to remove the strong wood and strengthen the spurs below these points.

When Fig. 2 was pruned at (*b*) it sent out the growth to (*c*). This continued to (*d*), (*e*), (*f*) and (*g*) during the succeeding years, and finally fruited on the terminal bud (*g*) last year. This growth should be removed to (*a*) at next pruning.

Fig. 3 was also pruned, only once, at (*b*) after which the fertile wood to (*c*) was produced, and it fruited as the scar indicates on the terminal bud (*c*). During the next two years it extended to (*e*) and (*f*) respectively. The following year it fruited at the terminal bud (*f*) and produced the piece of wood above that point. The sublateral fruited at the point (*d*), and subsequently developed the fruit spur on the extension. To prune this specimen remove the upper portion by cutting at (*a*).

Fig. 4 fruited on the terminal bud of the yearling wood at (*a*) and produced the extension to (*b*). This point was then the terminal on which it again fruited, and made the two-year-old wood above it. This

was cut at (*e*), when the yearling wood was produced, and the fruit buds on the two-year-old wood strengthened. To prune this specimen cut as shown at (*d*).

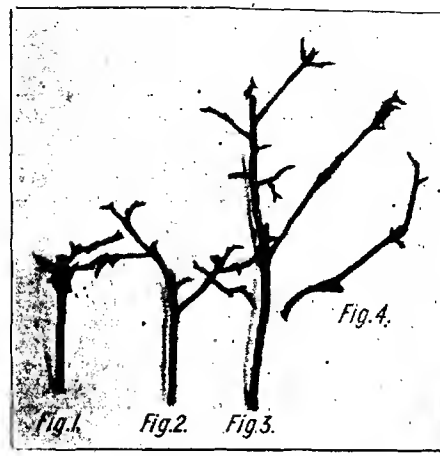


Plate 51.—Same four laterals pruned.

Plate 51 shows the result of this treatment. Figs. 1, 2, and 4 are of reasonable length, from 12 to 15 inches. Fig. 3 is rather too long, but provided the tree carries a plentiful supply of fruit wood, this may be shortened back to the lower spurs according to requirements.

(*To be continued.*)

It is a truism to say that fertilisers should be bought and used with discretion; of course they should, but it is well to keep distinctly in mind that they should be purchased solely for the amount of nitrogen, phosphoric acid, and potash contained in them, assuming always that the ingredients are derived from a good source, because there are some substances, such as leather, for instance, in which the nitrogen has no fertilising value, and there are others in which the nitrogen being partly inert, has not so much value as in good guano, nitrate of soda, and such high-class articles.

MORTALITY OF DAIRY COWS IN THE HAMILTON DISTRICT.

By E. W. Murphy, Dairy Supervisor.

Settlers on the Closer Settlements Blocks at Strathkellar, near Hamilton, have experienced keen disappointment, and incurred heavy losses, through the deaths of large numbers of milking cows. The estate was subdivided ten years ago, and preference was given to experienced dairymen, as the land was thought to be very suitable for dairy farming, but when I came to inspect the district in March, 1916, I found that the industry was at a very low ebb, and many of the farmers so disheartened as to have given up milking cows altogether.

On some of the blocks, cripples, paralysis, and rickets have been a continuous source of loss, and on other farms it was in droughty seasons only that there was any particular trouble. Many of the farmers have a very confused idea of the underlying causes of the evils, and I have not met any stock-owner yet who had a grasp of the whole of the facts. A clear understanding of the nature of the complaints, and of the predisposing causes, is of great importance, so that we can work on right lines towards overcoming them. I became acquainted with several drenches that gave good results. Mr. Chadderton, the Jersey breeder, informs me that since he has depended upon a simple drench (that was recommended by some cattlemen), he has not lost any, though the cows were affected in the same way as formerly, when they used to die. Mr. Chadderton uses one cup of kerosene with one cup of water and one tablespoonful of baking soda. I listened to the descriptions of the manner of the onset of the complaints, and came to clearly see that there was some other factor besides malnutrition, and eventually concluded that some form of infection or poisoning must be operating. Having formed such opinion, I looked up authorities on the question of forage poisoning, and found that Dr. S. S. Cameron gave an address on "Cripples" to the Chamber of Agriculture Convention in 1906, and *inter alia* he said, "the trouble is widespread, and I have frequently found that the nasal mucous membranes were engorged with blood," and he suggested that the cause was an infection through the nose, of Mycotic Poisoning.

Professor L. H. Pammel, Ph.D., of Iowa State College, in his *Manual of Poison Plants*, published in 1910, describes the symptoms of Forage Poisoning, and such description agrees completely with the reports of many of the cases occurring in this district. Among other names, it is called Epizootic Cerebro Spinal Meningitis, or known locally as "Grass Staggers," "Choking Distemper," &c., and he gives the symptoms as follows:—

"Weak, staggering gait, and the pharynx is either partially or completely paralysed. The tongue may be affected and protrude from the mouth, and saliva falls in strings from the lips. The pulse is variable. The respiration hurried and jerky. In the sub-acute cases the first

sign will be slowness of mastication and difficulty of swallowing; temperature sub-normal, and heart and respiration little affected, and the bladder and bowels inactive. There is but slight rigidity of the muscles, if any, and no evidence of pain is apparent. Such may last a few days, and then a gradual improvement occurs, or the paralysis may become more complete, and the general weakness more marked, paroxysms of delirium develop, with inability to stand, breathing becomes more laboured, coma comes on, and death results apparently without a struggle. This form lasts from six days to two weeks. As a rule, the *post-mortem* examination reveals no naked eye changes in the tissues of animals dead of forage poisoning.

In acute cases of forage poisoning, treatment is seldom successful, but quick-acting stimulants may be tried. In sub-acute cases a purge should be given to clear the intestines of the poisons. Strychnine in large doses to overcome the extreme depressions of the nerve centres, and atropin to support a failing circulation may be administered hypodermatically, at frequent intervals, with benefit. In very mild cases all that is necessary is to empty the bowels with a purge, and put the animal on feed above suspicion."

After reading the above statements and descriptions, and the treatment recommended, by the authorities mentioned, the following facts regarding methods of treatment which have been successful here, should be interesting:—Drenching with kerosene one cupful, water same quantity, and a tablespoonful of carbonate of soda, is a decided success; a decoction of a wild herb "sneezewort" and a decoction of yarrow and wormwood also gives good results. The wormwood is a powerful stimulant, and it is a vermifuge, and the yarrow takes the place of the atropin, as it affects the circulation. Professor Ewart says that an allied species of the "sneezewort" is used as a vermifuge, but that is all that he could say of it as a medicine. Yet I am satisfied from the reports of its effects, that it is a powerful stimulant also. Care must be taken that none of these agents are forced into the lungs, and when the animal is unable to swallow the medicine, a piece of guttapercha piping should be employed, and at Mr. P. Fry's farm at Victoria Valley I saw a very good device for this purpose. A piece of wood with two holes bored in it so that it can be tied on as a gag and a third hole large enough for the piping is bored through the middle, and with a funnel you can pour in a dose through the tube. As a number of cows have died during the past spring, and also since the New Year, and as the remedies that I speak of are not as well known as they deserve to be, I consider that the information is valuable, but the facts of paramount importance are those relating to the predisposing causes. Though there is an infection or poisoning in operation, it is certainly associated with malnutrition. The districts most affected are those which are very deficient in phosphate of lime, and in such areas the herbage is harsh and innutritious. Phosphate of lime is necessary for the vigorous and healthy growth of grass, and it is essential to the sound health of animals. If it is deficient, there cannot be the nervous energy that is needed for metabolism, and, in consequence, there is a lowered resistance to disease or the invasion by micro-organisms. In a disease like anthrax the control of infection is the salient point, but in respect to meningitis the medical profession emphasize the necessity of building up the general health, and thereby

the protective forces. In the *Scientific Australian* for December, 1915, Professor W. A. Osborne, D.Sc., states:—

"Protective substances exist in various grains, and if animals are fed on food deprived of such substances, polyneuritis develops." Skim milk is good for "cripples," and I heard the late Dr. Rothera give an address on the importance of the Vitamines in milk, but as milk contains lime and phosphorus the good results may be due to the minerals. Potatoes and apples also give good results, and plainly, good succulent food is essential to the maintenance of the protective forces of the cow's system. Rickets is undoubtedly a "deficiency disease," and in other cases the depletion of the nerves, causes a lowered vitality, and this in conjunction with harsh indigestible fodder, and reluctance to drink foul water, may cause impaction, pure and simple, which leads to fermentation and auto-intoxication that causes paralysis, but such is not always the cause of paralysis. Infection, or poisoning, inducing paralysis, may often be the cause of the impaction, and in many cases there is no impaction at all, but just paralysis of a vital part caused by the infection.

Cattle in this district are always chewing bones, and thus indicate their craving for phosphate of lime. They will lick up mortar made with lime, and they lick up the phosphatic manures if they can reach the bags. Sometimes they have favorite earth licks, and thereby are more liable to infection by organisms in the soil, and the earthy matter ingested may form hard insoluble balls of considerable size in the stomach. The habit of chewing bones involves the risk of sharp-pointed pieces being swallowed, and all sorts of rubbish is also chewed when they have such cravings, and the danger from sharp-pointed objects is increased, as such objects may pierce the stomach and penetrate the heart.

The great essential is the improvement of the pastures. Lime and phosphorus must be applied. It is a sound business proposition from every point of view. It means greater carrying capacity and prolonged seasons of growth. Through the increased vigour and vitality of the grass roots, the spring will be earlier, and it will stand the dry weather better, which means a longer milking season. Every form of stock farming depletes the soil of minerals, and this must be balanced by artificial manures or by feeding the cattle with purchased foods, that are rich in phosphates such as bran, if we are to maintain the fertility of the soil. Milk contains .7 per cent. of minerals, and if the herbage is deficient, then the cow's system is depleted of essential elements, and she goes down. Some of the Strathkellar paddocks were never any good for cows, and very plainly the whole countryside is badly in need of phosphorus and lime. Very good ground limestone is obtained at Heywood, 36 miles from Hamilton, and there are deposits of lime, a few miles down the Grange Creek from Hamilton, that should be well worth opening up. The depletion of the dairy herds and the losses of other cattle have become very serious matters indeed. The prevention of the slaughter of the female stock may be a contentious matter, but there can be no doubt as to the wisdom of any steps that will increase the supply of fodder or improve its quality, at a reasonable cost. It is obvious enough that much can be done in the way of conserving spring growths that now go to waste, and the silo, and the meadow haystacks are conspicuous by their absence; but, above all, I strenuously advocate the improvement of the pasture by top-dressings of lime and phosphates.

NOTES ON PORTUGUESE WINE VARIETIES.

By F. de Castella, Government Viticulturist.

(Concluded from page 686.)

In conclusion of this somewhat lengthy description of the varieties grown for the production of Port wine in its native Portugal, a few more sorts must be mentioned, but since, with the exception of Tinto Cao and perhaps also of Tinta Carvalha and Tinta Roriz *, they are unlikely to prove valuable acquisitions for Victorian vineyards, brief descriptions will suffice.

The varieties to be described in the present article are the various "Tintas" and a few other sorts not much cultivated now, even in Portugal. The Tintas do not really make up a group; their inclusion under one heading is a matter of chance rather than one of common origin, since the different vines are not related in any way. The word "Tinta" in connexion with a vine merely signifies *red* or *black;* in fact, "dark coloured." Tinta Roriz thus means nothing more than Roriz black, and so on.

Of the varieties which follow, Tinta Cao and Tinta Francisca are quality sorts. The others are vines grown for quantity rather than quality; they are, in fact, the *bourgeois*, or common, varieties which, according to Sr. Duarte de Oliveira, save the situation by preventing the yield of the Douro vineyards from being altogether too low (see *Journal*, September, 1916, p. 569).

The exact value of Portuguese wine grapes, especially of the quantity sorts, is not always easy to correctly estimate, owing to the system of blending the grapes of a good many different varieties in the fermenting vat, or lagar. In fact, until recently, it was a common practice for the vines to be mixed in the vineyard instead of being grown in separate blocks.

Tinto Cão.

Tinto Cao is undoubtedly one of the leading quality varieties cultivated in the Alto Douro. It may be assimilated to the Bastardo type, since it produces wines of excellent bouquet and flavour, and which mature rapidly. Seeing that it does not possess the defect of Bastardo of shrivelling too readily in a warm autumn, it would seem to be well suited for sweet wine production in Northern Victoria.

When visiting Portugal in 1907, the writer was informed by one of the partners in the well-known firm of Cockburn, Smithes, and Co. that the quality of the wine yielded by one of their choicest quintas, or vineyards, was mainly due to the fact that so large a proportion of Tinto Cao is grown there.

Rebello da Fonseca (1791) says of it—"Tinto Cão . . . merits one of the first places amongst the vines cultivated in Portugal: it ripens well, and neither dries up nor rots; it does not yield excessively, nevertheless of its crop everything is preserved, and from it is made a wine of good body (*muito coberto*), strong and generous." He relates how Sr. Manuel Xavier Ribeiro Vaz de Carvalho made in 1771 some wine from this grape alone, and it proved superior to all his other wine and to those made by his neighbours: a wine so highly thought of by the

* Tintas Carvalha and Roriz may prove of value in Victoria for the production of dry red wines

English merchant Francis Bearley that he would have bought it at an extraordinary price had this not been contrary to the law.*

He attributes the superiority of the wines of Guimes over all the other wines of the Alto Douro to the fact that "in these vineyards are cultivated a great quantity of Tinto Cão and Pé Agudo, which mixed with Alvarelhão . . . . make a wine which the English merchants most esteem at the present time; they acknowledge that they find in it colour, bouquet, body, and flavour to their entire satisfaction." He further states that it is a variety which grows so vigorously, and has so much foliage that the fruit is too much sheltered and thereby hindered from ripening, for which reason it should be pruned to three or four spurs of three or four eyes each, according to the vigour of the vine.

Fig. 16.—Vine of Tinto Cão.

Photo. taken in October, 1907, at Boa Vista. Note the extremely stony nature of the soil and the curious method of training to numerous small stakes (mostly bamboo), which was general in the Alto Duro district, but which is now being gradually replaced by wire trellis.

Like Mourisco Preto, it was, in the early days of the phylloxera invasion, erroneously supposed to be phylloxera resistant, and seedlings from it were largely raised and distributed, but without practical result.

Sr. Duarte de Oliveira deals at some length with this vine in *Ampelographie*. Its origin is unknown, but it is probably a native of Portugal, where it has been known for a very long time. The name Tinto Cao signifies red dog, or rather black dog, no doubt in reference

* The price fixed by the Companhia Geral das Vinhas do Alto Douro for these wines was 25,000 reis, equal to 125 francs per pipe of 550 litres (£5 for 121 gallons), according to laws of the time, and this price could undergo no modification, even in years of insignificant crop. This company was created in 1756 by the Marques de Pombal, the celebrated Minister of King Don Jose I. (Duarte de Oliveira in Ampelographie).

to the colour of the berries. He regrets the neglect of this and a few other of the choicest Alto Douro varieties since reconstitution.

"On going through the ancient Douro vineyards, those especially which by their importance have created the just reputation of port wine, one regrets deeply to see that celebrated vines like Tinto Cão, true creators of our great wealth, are disappearing more and more to make place for others quite plebeian, and which have not the least title to recommend them, and to cause them to be received among the noble varieties which clothe the steep hills bordering the impetuous river of Northern Portugal. But a similar wrong tendency prevails in all countries; in Spain as in Italy; in France as in Portugal; here, especially in the region of wines which have no rivals in the world as liqueur wines, the error exists, and it is one that will cause itself to be felt ere long of abandoning little by little the varieties which have created their reputation during long years."

He cannot understand Odart, who says of it, "Good wine, a little hard; needs ageing," and points out that on the other hand table wine

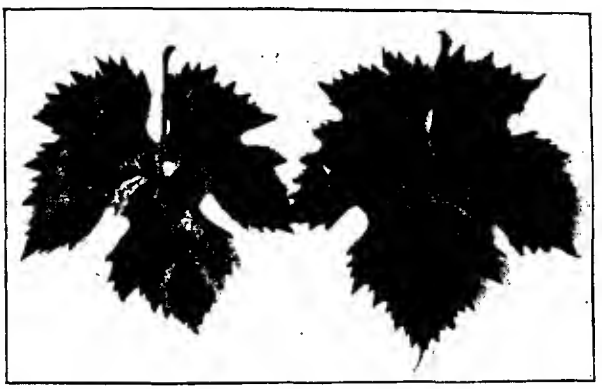


Fig. 17.—Leaves of Tinta Cão (about one-third natural size).
Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907.

made from Tinto Cão does not need to be too old for it to be irreproachable. He quotes Dr. Joaquim Pinheiro d'Azevedo Leite, who says, "As it is a vine of medium yield, it is little grafted, especially now that more productive varieties are preferred."

In order that it may show what it is worth from a wine-making stand-point, it requires a good aspect and the schistose soil of the Douro, which is very poor, and where manuring is not practised. In old days, the laws of the country prohibited the manuring of vineyards, the object being to sacrifice quantity to quality. (Law of King Don Jose I., 30th August, 1757.)

On richer soils this variety is capable of yielding much heavier crops, though naturally not of wine of the same quality.

The wine of Tinto Cão is very perfumed, and reminds one of that of Touriga, though its colour is not so deep. Pinto Villar (1815) is quoted as saying that this variety produces an excellent wine with a magnificent bouquet and a charming flavour, but it lacks colour.

The following Ampelographical description is given:—

Vine.—Of medium strength; main stem flattened and twisted; bark ash colour, detaching in short strips.

Buds.—Large, young leaves, five-lobed; silky and ashy white; bordered and spotted with rosy carmine above; under side cottony, white; teeth well marked, deep carmine at the points.

Fig. 18.—Bunches of Tinta Cão.
Reproduced from *O Portugal vinicola*. Reduced to two fifths natural size.

Canes.—Very long, round, of medium thickness, trailing, light-green, striated with red on the side exposed to the sun, downy, brittle at the knots, internodes long, 10 to 15 cm. (3.9 to 5.8 in.), knots medium; tendrils bi, or tri-furcate, numerous, tinted with red, very long and slender.

Leaves.—Large, thin, as broad as long, five-lobed; upper sinus little open and shallow, often with a tooth at the base of the sinus; lower sinus also little open and sometimes scarcely indicated; they also have, like the upper ones, a tooth

at the base. The petiolar sinus is cut out in the shape of an inverted U; upper surface yellowish-green, glabrous; veins of a paler yellow and not prominent; lower surface yellowish and cottony; veins paler and stronger; teeth small, in two series, those terminating the lobes are large and prominent; all more or less mucronate. Petiole cylindrical, strong, long, slightly downy, tinted red.

Fruit.—Bunches *medium* size, loose, conical, usually the stalk divides at its first joint, bearing two bunches of almost the same shape; when the bunch is single it is tighter, and bears shoulders on long stalks; stalk striated, very long, the upper part cylindrical and woody, and the lower part herbaceous, flattened or fasciated; pedicells short, slender; swelling large, with a few scattered brown warts; core large and vinous colour, not easily detached—berries small, almost spherical, black with bluish reflections; flesh not very juicy, soft, with a single flavour, and sometimes slightly acid before complete maturity; skin thin and soft; style point not very visible. Pips per 100 berries—2 with one, 40 with two, 45 with three, and 13 with four.

As will be seen from the photo, the leaves of Tinto Cão are strikingly different from those of most other vines, reminding one almost of those of an Oriental plane, thus rendering this vine very easy of identification.

Tinta Francisca.

Synonyms: Tinta Franceza, Tinta de Franca.

Tinta Francisca is another of the choice port wine sorts; most of the leading authorities speaking very highly of it. It is a vine well suited for the driest and hottest Douro hillsides, since it does not suffer from sunburn. In moister situations and on richer soil it does not thrive; it comes into leaf very late, and often sets its fruit badly. On the Douro it is considered a good bearer.

Much confusion has arisen, in Portugal, in connexion with this variety, and its two synonyms given above, several distinct vines being sometimes cultivated under one or other of these names in different districts. Amongst others, the French *Teinturier*, the red-juiced grape we call Tinto, in Victoria, is sometimes known as Tinta Francisca. Nevertheless, the true vine of this name is a well-defined sort, and one of the principal ones in Douro and Traz os Montes, the port wine region.

The wine yielded by it is of excellent quality, possessing much bouquet and good body; it has also a good deal of colour, though this is rather unstable. Its wine is in fact rather soft, and ages very rapidly; this appears to be its main defect. It is, in short, a wine liable to oxidation, which becomes tawny or onion-peel colour at two or three years old.

Tinta Carvalha.

Two distinct vines are known under this name in Portugal; one of which is grown on the Douro, and the other in the Traz os Montes district; the former is the most important, and the only one deserving attention here.

Carvalha means oak, but this tree has no connexion with the name of the vine. Several Portuguese vineyards are called Quinta das Carvalhas (The Oaks Vineyard), and a vine, especially if a new introduction, is often called after the vineyard from which it was obtained.

Tinta Carvalha is a quantity rather than a quality variety. It belongs to the group known in Portugal as Tintas Grossas.* Nevertheless, the wine made from it is of delicate flavour, though lacking in body

* Literally, black grapes with large berries.

and colour. It is something after the style of that yielded by Donzellinho do Castello and Mourisco Preto, though possessing less bouquet. Though a quantity variety, it is nevertheless to be found in most of the good Douro vineyards, and its wine appears to be of higher grade than that of the other heavy bearers grown on the Douro.

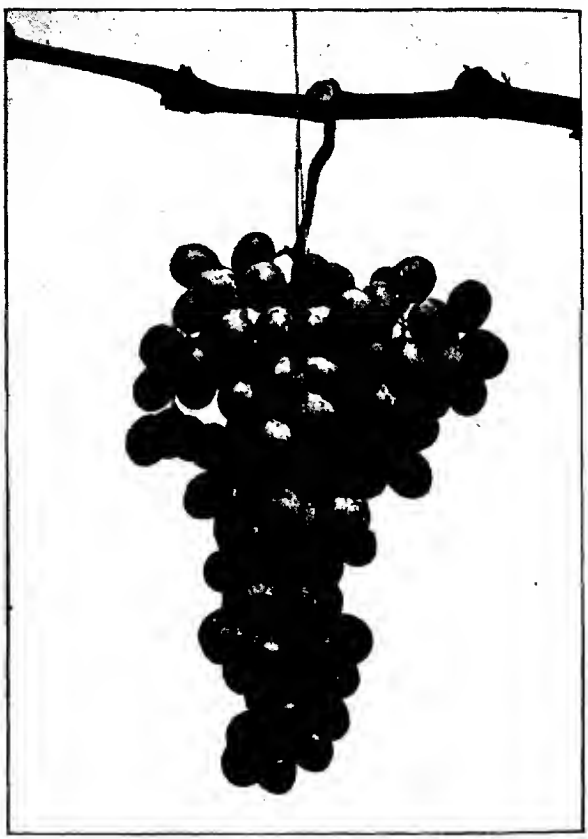


Fig. 19.—Bunch of Tinta Francisca.
Reproduced from *O Portugal vinicola*. Reduced to about one-half natural size.

This vine may prove of value in Victoria, but rather for the making of light dry table wines than for those of Port type. Even when made into a light dry wine in Portugal, it benefits by being blended with some Souzão or Touriga to improve the colour.

It may be pruned short, or according to the Guyot system, with short rods; if pruned too long it soon exhausts itself and ceases to produce abundantly. It does very well grafted on Du Lot. It suffers little from Oidium, comes into leaf early, the fruit turns colour very early in the autumn, and ripens early; but, like Chasselas, the grapes hang well on the vine.†

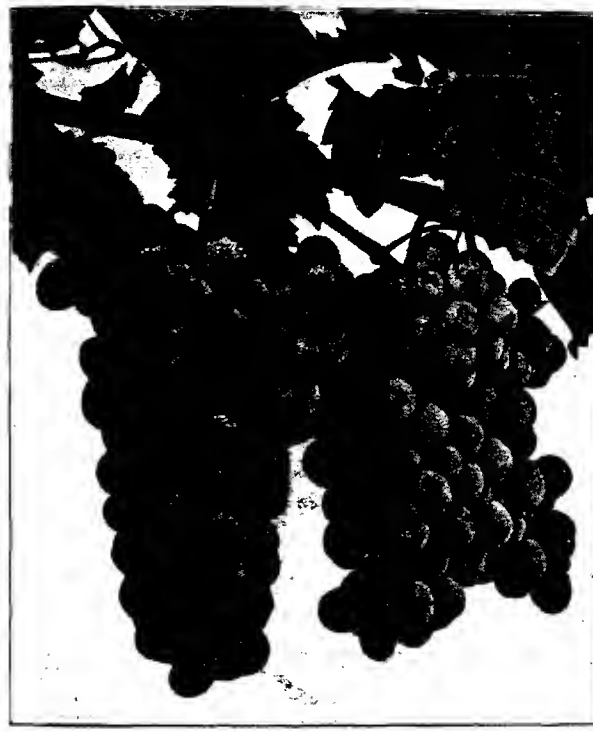


Fig. 20.—Bunches of Tinta Carvalha.

Reproduced from *O Portugal vinicola*. Nearly one-half natural size.

Tinta Amarella.

This is another of the "quantity" varieties of the Alto Douro, and one concerning which the earlier writers seemed to have formed a higher opinion than present day authorities.

† Particulars taken from the article by Sr. Duarte de Oliveira, in *Ampelographie*.

Gyrao (1822) tells us that—

"Tinta Amarella gives much wine; it requires strong soil. The wine made from it by Srs. Villares in the course of their wine-making experiments was of good flavour (*gostoso*) and of yellowish colour."

Villa Maior (1865) mentions it in several well-known Quintas, and states that—

"It is incontestably one of the sorts of best reputation on the Douro. . . . It was one of those chosen to predominate at the Quinta dos Arcyprestes (Alto Douro) and was preferred for the hottest situations at the Quinta do Noval." Writing in 1875 he says: "It is one of the best grapes of the Douro; very productive, with very tight bunches of sweet berries, for which reason the bees seek them in preference to other sorts. Tinta Amarella requires to be grown on strong soils in order that it may prosper."

Sr. Duarte de Oliveira does not hold so high an opinion of it, classing it essentially as a quantity variety, yielding a wine of a rather dull red

Fig. 21.—Leaf of Tinta Amarella (about one-third natural size).
Photo. taken at Boa Vista, Alto Douro, Portugal, in October, 1907.

colour, becoming an unattractive rust colour whilst still young. It is a flat wine without briskness or character, either as regards bouquet or flavour, and of little use for the production of dry table wines. It is one of the Douro varieties which yields most juice; curiously enough, the grapes seem to contain even more juice as they become overripe. The fruit is rather liable to rot in a wet vintage.

Since reconstitution, this vine has been somewhat discarded in the true port region, but in the neighbouring district of Baixo Corgo it was propagated to such an extent as to impair the quality of the wine.

The word Amarella means in Portuguese "yellow." It appears to refer to the canes, which are of a yellowish-brown colour in early winter,

and more especially to the leaves, which are of a yellowish-green colour, more particularly in early spring.

It is a vine which does well on sunny hillsides, since it requires warmth to ripen thoroughly. It may be pruned, according to the Guyot

Fig. 22.—Bunch of Tinta Amarella.

Reproduced from *O Portugal vinicola.* One-half natural size.

system (single or double) with short rods. One of its peculiarities is that a good many of its buds are blind and do not sprout in spring; it is somewhat liable to *encannelamento,* the somewhat mysterious disease known as *court noué* in France; it seems to be fairly resistant to fungus diseases.

Tinta Roriz.

This is a vine of unknown but apparently somewhat recent origin, since it is only mentioned by recent writers. It is probably named after the Quinta de Roriz, where it is rather largely grown; it has become popular on the Douro since reconstitution.

It is essentially a "quantity" variety, producing abundantly, and the yield of juice (per ton of grapes) being very high. The bunches are very large, with large black berries of sweet, agreeable flavour, slightly acid. It is a variety of value which gives character to the wine which it produces.*

Sr. Duarte de Oliveira thinks that if it were not mixed with choicer sorts its must, which is flat and without special flavour, would not produce a wine of quality. It is not a variety calculated to bring renown to a vineyard. Curiously enough, it is in cooler districts that its must seems to contain more sugar, as compared with other standard sorts such as Mourisco Preto. It is a very heavy bearer, which does well with long pruning. It is very liable to fungus diseases.

. . . . . .

The remaining port wine varieties do not merit detailed description; they may be summarized as follows (particulars taken from Ampelographie):—

Entreverde.—An old Portuguese variety ripening very late; almost unknown nowadays.

Casculho.—A Douro variety, scattered and scarce in the vineyards.

Mureto (or *Moreto*).—An old Douro grape, which has been almost completely neglected since reconstitution, though wrongly so, according to Sr. Duarte de Oliveira, since it is essentially a quality variety, yielding a fine ruby-coloured wine with a special character of its own. It is a good bearer, and well suited for warm dry situations.

Nervoeira.—A very heavy yielding vine, producing a red wine, light in colour, with scarcely any bouquet, and fairly acid, with a slight gooseberry flavour—a very common wine.

Péagudo.—A black Douro variety, which is disappearing from the vineyards since reconstitution.

Tinta Castelloa.—A very old Douro variety, suited for deep rich soils, although also grown on dry hillsides—abandoned a good deal since reconstitution, owing to irregular yield and liability to set badly—wine of rather poor quality, similar to that of Tinta Amarella.

Tinta Lameira.—Similar to last named, though the wine appears to be of better quality.

Tinta Morella.—A little-known Douro variety—large-shouldered bunches with large, light-red, oval berries.

Tinta Pinhera.—Said to be synonymous with Pinot Aigret, an inferior form of the Pinot Noir of Burgundy.

* Cincinato da Costa, in *O Portugal Vinicola*

THE BUILDING OF A GOOD HERD.

(a) TEST YOUR COWS.

By J. Kyle, Dairy Supervisor.

Many of our dairy farmers sell good cows considering them to be worthless. This apparently is a peculiar statement to make, but, nevertheless, it is only too true, and it is an astounding fact that so many of our dairy farmers have so little idea of the actual value of their cows. This unfortunate state of affairs will continue to exist until accurate records of the milk yield from each individual cow are kept and the use of the Babcock tester becomes more general. The only reliable way to arrive at the true merits of any dairy cow is to estimate her value by the use of the Babcock test and the keeping of accurate records of the quantity of milk she gives. Unless the individual yields from each cow are carefully noted, it is impossible to make a proper selection of a profitable cow. Cow testing thus enables the farmer to find out the cows that are profitable, and those that are not paying their way. In some cases over one-quarter of the herd has been found when the milk was tested to be unprofitable. This means to the farmer a direct loss in energy, feed, and money.

The average production per cow of milk and butter-fat in this State is not what it should be; this is the result of keeping such a large number of unprofitable cows. It is impossible to detect unless a system of weighing the milk from each individual cow, keeping her records, and the use of the Babcock tester, be carried out. By this system the farmer is enabled to find out which cows are the best producers of milk and butter-fat. It is hardly possible to estimate the real value of a dairy cow by outward appearances, as it is known that the milk of some of our best looking cows is very low in butter-fat.

Cow testing also helps to discover the great differences in persistency of the milk flow, and the slightest variation in the individual records causes the owner to look for the reason of the shrinkage.

The habit of keeping records makes one more observant of all the little details that make the difference between success and failure. A certain amount of emulation is bound to result from comparing one cow with another. The attendants will take a pride in their cows, feed them better, and get better results from studying each cow as an individual performer.

The financial aspect after a few years is very gratifying, as higher prices are obtained for the progeny of the cows with a good record of merit, and the cows themselves are worth much more than those without a record of any kind.

Keeping of records and the use of the Babcock tester are everything in the dairying business. Do you weigh and test your milk? If not, start now.

(b) SELECT YOUR BULL.

By Alex. Mess, Dairy Supervisor.

Although the average farmer cannot afford to commence with a herd of pure-bred cows, he, on the other hand, should, at any reasonable cost, procure a pure-bred bull.

It should, of course, be the aim of every dairy farmer to improve his herd, and this aim may be hastened greatly by the use of a sire of undoubted milking strain. The old saying, "The bull is half the herd," should be taken to heart. If a farmer persists in using a cheap mongrel bull he is employing the very best means of courting disaster. And I am convinced that the use of inferior bulls is one of the very greatest hindrances to progress in dairy farming.

A bull should never be purchased simply because he has a pedigree, unless such pedigree proves that he has descended from ancestors who were possessed of undoubted dairy qualities and robust constitution. A bull of this class is never too dear.

Once the breed of your sire is chosen, stick to it through thick and thin; do not commence crossing and re-crossing. If indiscriminate breeding is persisted in no real success need ever be looked for, and it is the persistent crossing of all kinds of live stock that is the mischief of the whole live stock industry.

It is very foolish for a dairy-farmer to expect that he can improve his dairy herd by such a system. A good herd may be built up from cross-bred cows by the use of a pure-bred bull possessing an undeniable pedigree of performance, while the use of mongrel sires (which should have their roving propensities settled) as foundations bring about evils which take years to eradicate. It should be remembered whichever breed is chosen that to be successful requires the greatest care and attention on the part of the breeder.

EUCALYPTUS OIL.

F. R. Beuhne, Government Apiculturist.

As inquiries are frequently received as to the amount of oil obtainable from the different species of eucalypts, and only very expensive scientific books are available on the subject, it appears to be advisable to publish a list of the Victorian eucalypts under their common and also their botanical names, together with the percentage of oil and the amount in lbs. and ozs. obtainable per 1,000 lbs. of foliage.

It must, however, not be understood that those species containing the highest percentage of oil would be the most profitable in the commercial production of eucalyptus oil.

The oils of different species vary considerably in quality and in value. Some of the eucalypts with a high percentage of oil are large trees, and involve a considerably larger amount of labour and a greater amount of waste than some of the Mallee species, the foliage of which is easy to collect, and the oil, though not present in the highest percentages, is of finer quality.

There are, of course, other local factors, such as a supply of water, distance from railway, &c., which are not within the scope of this article.

Amount of oil obtained per 1,000 lbs. of foliage of 50 species of eucalypts as given by Baker and Smith in *Research on the Eucalypts.*

Amount of Oil Obtained per 1,000 lbs. Foliage.

Vernacular Name.	Botanical Name.	per. cwt.	lbs. ozs.
1. Narrow-leaved Peppermint ..	*Eucalyptus amygdalina* ..	3·393	33 15
2. Broad-leaved Peppermint ..	,, *dives* ..	2·233	22 5
3. Red Mountain Ash	,, *Delegatensis* ..	1·760	17 10
4. River White Gum	.. *radiata* ..	1·641	16 7
5. White Top Gum	,, *vitrea* ..	1·480	14 13
6. Gully Gum	,, *Smithii* ..	1·434	14 5
7. Blue Mallee	,, *polybractea* ..	1·350	13 8
8. Spotted Blue Gum	,, *Maideni* ..	1·304	13 1
9. Mealy Stringybark	,, *cinerea* ..	1·188	11 14
10. Green Mallee	,, *viridis* ..	1·060	10 10
11. Small Giant Mallee	,, *dumosa* ..	·999	10 0
12. Oil Mallee	,, *oleosa* ..	·970	9 11
13. Gippsland Box	,, *Bosistoiana* ..	·968	9 11
14. Slender Mallee	,, *caligcogona* ..	·901	9 0
15. Mountain Gum	,, *goniocalyx* ..	·881	8 13
16. Giant Mallee	,, *incrassata* ..	·880	8 12
17. White Brittle Gum	,, *maculosa* ..	·846	8 7
18. Red Box	.. *polyanthemos*	·834	8 6
19. Sallow Gum	.. *camphora* ..	·836	8 6
20. Blue Gum	.. *globulus* ..	·745	7 7
21. White Stringybark	.. *eugenoides* ..	·742	7 7
22. Long-leaved Box	,, *elaophora* ..	·732	7 5
23. Messmate	,, *obliqua* ..	·677	6 12
24. Yellow Box	,, *melliodora* ..	·676	6 12
25. Scented Peppermint	,, *odorata* ..	·640	6 6
26. Peppermint Gum	,, *piperita* ..	·627	6 4
27. But But	,, *Bridgesiana* ..	·619	6 3
28. Bull Mallee	,, *Behriana* ..	·614	6 2
29. Lemon-scented Gum	,, *citriodora* ..	·586	5 14
30. Grey Box	.. *hemiphloia* ..	·554	5 9
31. Red Ironbark	.. *sidroxylon* ..	·537	5 6
32. Woolly Butt	,, *longifolia* ..	·535	5 6
33. Black Box	,, *bicolor* ..	·520	5 3
34. Forest Red Gum	,, *tereticornis* ..	·482	4 13
35. Hooked Mallee	,, *uncinata* ..	·433	4 5
36. Silver Top	,, *Sieberiana* ..	·421	4 3
37. Apple Gum	,, *Stuartiana* ..	·394	3 15
38. Manna Gum	.. *viminalis* ..	·354	3 9
39. River Red Gum	,, *rostrata* ..	·299	3 0
40. Black Sallee	,, *stellulata* ..	·293	2 15
41. Red Stringybark	,, *macrorryncha*	·272	2 12
42. Brown Messmate	,, *haemastoma* ..	·241	2 7
43. Swamp Gum	,, *paludosa* ..	·197	2 0
44. Spotted Gum	,, *maculata* ..	·169	1 11
45. Black Butt	,, *pilularis* ..	·130	1 5
46. Brown Stringybark	,, *capitellata* ..	·103	1 0
47. Grey Ironbark	,, *paniculata* ..	·088	0 14
48. Mahogany Gum	,, *botryoides* ..	·085	0 14
49. Blood Wood	.. *corymbosa* ..	·060	0 10
50. Candlebark Gum	.. *rubida* ..	·008	0 1

Note.—Numbers 16, 25, and 35 do not appear in Messrs. Baker & Smith's list and are taken from F. v. Mueller's Eucalyptographia.

The following is a good recipe for preparing grafting-wax, the chief object of which is to exclude the air from the cuts on both stock and scion:—4 lbs. resin, 2 lbs. beeswax, 1 lb. mutton tallow. Dissolve over slow fire and apply warm. The wax should not be made hard enough to crack after being applied.

Horse labour is a necessary item on the dairy farm, and should command much attention from the manager. If its efficiency drops the profits of the farm are decreased, and the profits from the cows must bear a loss in the horse labour item. It is seen then that successful dairying is not making a success with cows alone, but profitably combining a number of factors. Man, labour, and crop yields per acre are other important factors that can be controlled to a considerable extent by the manager.

AN EXPERIMENT TO SHOW EFFECT ON QUANTITY AND QUALITY OF MILK PRODUCED BY COWS WHEN MILKED AT EQUAL AND UNEQUAL PERIODS.

The results of two dairy experiments conducted at Offerton Hall, extending from May, 1912, until April, 1915, are here reproduced. The Durham County Council has set aside a sum not exceeding £120 a year for these investigations which it places at the disposal of Armstrong College, Newcastle-upon-Tyne. The extracts are from the Offerton *Bulletin*, No. 5 Report on further Experiments on the feeding of Dairy Cows at Offerton Hall, by Frank P. Walker, M.Sc., F.H.A.S., adviser in agriculture to the above College.—*Editor.*

The exigencies of the new milk trade in many cases involve a great difference in the times between morning's and evening's milking periods. Apart altogether from the general feeding and management of a milking herd this difference in the time of milkings makes a considerable difference to the quality of the milk. It may be generally said that the longer the period between the milkings, the poorer the quality of the milk. Other experiments have shown that when the periods between the milkings more closely approximate than is the usual practice, the quality of the morning's and evening's milk is very similar. A previous experiment at Offerton Hall in 1905 confirmed this, but the experiment only lasted for a period of eighteen days. The object of these experimente was to see how far deductions based on a short trial would be confirmed when the experiments lasted over a considerably longer period, the cows being reversed during the later experiment.

For this experiment not quite so many cows in full milk were available as is usual, and it was felt that one or two of the stale milkers might not continue to milk throughout the experiments. As a fact it has to be recorded that one cow had fallen to a gallon a day by 2nd September, and was only giving 2 quarts per day at the end of the experimental period on 22nd September.

Experiments U and V lasted from 1st July to 22nd September inclusive during the summer of 1911.

Experiment U.

Preliminary Trials.—These trials lasted for a period of three weeks, and at the end of them the two lots of cows stood as follows:—

——	Total Yield in Pints per Lot per Day at end of Preliminary Trials.	Average Yield of Milk per Cow in Pints per Day.	Percentage of Butter-fat in Total Daily Yield.	Average Live-weight per Cow.
Lot I. ..	128·63	25·72	3·67	1,218 lbs.
Lot II. ..	128·44	25·68	3·66	1,142 lbs.

Rations.—As will be remembered the summer of 1911 was exceptionally hot and pastures became very bare. Throughout the experiments both lots of cows received per cow per day a mixture of 2 lbs. of soya bean cake, and 2 lbs. of Bombay cotton cake. After 10th July both lots received tares in addition, and on 24th July they were turned on to a clover fogg. On 2nd September, as tares were finished, the cows received a small amount per day of clover cut green, and after 9th September a very small quantity of turnips on the grass.

During the period of Experiment U, which lasted from 1st July to 11th August, the cows of Lot I. were milked at equal intervals of twelve hours each, viz.:—at 6 a.m. and 6 p.m., while those of Lot II. at unequal intervals of fourteen and ten hours respectively, viz.:—at 6 a.m. and 4 p.m.

Table LXXVI.—Average Quantity of Milk in Pints per Lot per Day for Six Weeks.

Week ending	Lot I Milked at 6 a.m. and at 6 p.m.			Lot II. Milked at 6 a.m. and at 4 p.m.		
	Morning.	Evening.	Total.	Morning.	Evening.	Total.
1911.						
7th July	53·5	58	111·5	61·5	54·5	116
14th July	53	54·5	107·5	60·5	48	108·5
21st July	49·5	53	102·5	57·5	48·5	106
28th July	47·5	51	98·5	56·5	49·5	106
4th August	48·5	51	99·5	57·5	48	105·5
11th August ..	44	47	91	55·5	45·5	101
Average per lot per day for each of six weeks	**49·33**	**52·41**	**101·75**	**58·16**	**49**	**107·16**

Results.—A fortnight elapsed between the end of the preliminary trials and the commencement of the actual experiment. Owing no doubt largely to the drought there was a considerable falling off in the average daily yield of the two lots.

Table LXXVI. shows the average weekly fluctuations in the two lots. It is a striking fact that in every weekly average where in Lot I. the cows were milked at equal intervals, the quantity of milk given at the evening's milking was always greater than that given during the morning. This result is also confirmed by Table LXXIX. in the succeeding experiment. On the other hand, whereas in Lot II., the hours of milking were uneven, the quantity of milk given at the morning's milking was always greater than at the evening. A result in agreement with general practice.

From a further study of Table LXXVI. it would appear that equal milkings tended to decrease the actual flow of milk. This, however, is not a fair deduction, inasmuch as one of the cows of Lot I. fell off her milk somewhat rapidly owing to advanced period of lactation, and in the following experiment in spite of the fact that these cows were then being milked at unequal intervals, the fall in the average weekly flow of this same group of cows was greater than in the other.

TABLE LXXVII.—AVERAGE PERCENTAGES OF BUTTER-FAT IN MILK FOR EACH OF SIX WEEKS.

Week ending –	Lot I. Milked at 6 a.m. and at 6 p.m.		Lot II. Milked at 6 a.m. and at 4 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
7th July	3·6	3·3	3·5	3·9
14th July	3·8	3·5	3·2	4·2
21st July	3·4	3·6	3	4
28th July	3·65	3·3	3	4
4th August	3·6	3·2	2·96	4
11th August	3·6	3·2	2·97	3·9
Average for each of six weeks	**3·6**	**3·35**	**3·07**	**4**
Times milkings were under the standard during six weeks	(—)	2	12	( )
Highest	4·1	3·9	3·6	4·7
Lowest	3·1	2·7	2·4	3·6

	Lot I.	Lot II.
Average percentage of butter-fat in total daily yield ..	3·47	3·49
Total butter-fat in lb. per day	3·53	3·74

QUALITY OF THE MILK.—Table LXXVII. indicates that equal periods of milking are strikingly conducive to normal percentages of fat in both morning's and evening's milk. As is well known, there is often a great difficulty in getting the milk of cows up to the 3 per cent. of fat limit each morning. If by every means possible care be taken to equalize the intervals of milking there is no doubt that this would do away with a good deal of trouble and worry to those farmers who are anxiously desirous of producing milk of even quality. During a period of six weeks in no case in the morning in the group of cows constituting Lot I. was the milk below the recognised standard. Twice during the

evening it did fall below such a standard, but only just below. On twelve occasions in the morning, however, the milk of the group comprising Lot II. milked at unequal intervals fell below the 3 per cent. limit, and seriously so. Further, the average percentage of fat for the whole six weeks in equal periods of milking differs only by .25 per cent., whereas, this difference in the case of unequal periods of milking is equal to .93 per cent. The percentage of fat actually produced in the total daily yield is in the two groups practically the same.

TABLE LXXVIII.—AVERAGE PERCENTAGES OF SOLIDS NOT FAT IN MILK FOR EACH OF SIX WEEKS.

Week ending—	Lot I. Milked at 6 a.m. and at 6 p.m.		Lot II. Milked at 6 a.m. and at 4 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
7th July	9·1	9	9	8·8
14th July	8·8	9	8·7	8·7
21st July	8·8	9	8·8	8·7
28th July	8·7	8·7	8·7	8·6
4th August	9	9	8·8	8·8
11th August	8·9	8·9	8·8	8·7
Average for each of six weeks	**8·88**	**8·93**	**8·8**	**8·72**
Times milkings were under standard ..	(—)	(—)	1	2
Highest	9·4	9·4	9·2	9·3
Lowest	8·5	8·6	8·4	8·4

	Lot I.	Lot II.
Average percentage in total daily yield	8·9	8·75
Total solids not fat in lb. in daily yield	9·06	9·39

SOLIDS NOT FAT.—During the summer of 1911 frequent complaints were made that owing to the drought there was a tendency for the milk to fall below the standard of 8.5 per cent. in non-fatty solids. So far as this experiment goes Table LXXVIII. shows that this was not the case, as in practically all cases the milk was of normal quality. It is only fair to state that in the north the drought was not of such intensity as in the midlands and south. The cows, too, under experiment, as already shown, were receiving a fairly liberal supply of cakes together with vetches or clover cut for them.

Experiment V.

On 12th August those cows in Lot I. which, during the previous experiment, had been milked at equal intervals were for the following six weeks milked at unequal intervals, and those of Lot II., which had been milked at unequal intervals, were now milked at even intervals of twelve hours each.

RESULTS.—As regards the actual flow of milk Table LXXIX. shows that the cows constituting Lot I., and now milked at unequal intervals,

show a much greater decrease in the average weekly flow of milk than those comprising Lot II. This was no doubt due to the fact that one of these cows continued rapidly to go off her milk, as at the end of the experiment on 22nd September, she was only giving 2 quarts per day. This smaller flow of milk is therefore due to the individuality of the cows and not to the difference of the milking periods. On the other hand Table LXXIX. shows that the quantity of milk given at the evening's milking, by equal milking periods is greater than at the morning's milking. A result which strikingly confirms the one shown in the previous experiment.

TABLE LXXIX.—AVERAGE QUANTITY OF MILK IN PINTS PER LOT PER DAY FOR SIX WEEKS.

Week ending -	Lot I. Milked at 6 a.m. and at 4 p.m.			Lot II. Milked at 6 a.m. and at 6 p.m.		
	Morning.	Evening.	Total.	Morning.	Evening.	Total.
1911.						
18th August ..	45·5	40·5	86	48	49	97
25th August ..	45	37	82	44·5	47·5	92
1st September ..	42·5	35	77·5	45·5	47·5	93
8th September ..	38	30·5	68·5	42·5	43	85·5
15th September ..	35	29	64	41·5	43·5	85
22nd September ..	30	26·5	56·5	40	40	80
Average per lot per day for each of six weeks	**39·33**	**33·08**	**72·43**	**43·66**	**45·08**	**88·75**

QUALITY OF THE MILK.—If the deductions with regard to the more even quality of morning's and evening's milk from equal periods made from the previous experiment were sound, it would naturally be expected that when the milking periods were reversed for the two lots of cows the results of Experiment V would confirm the previous one. Table LXXX. shows this confirmation in a very satisfactory manner. In every case but one of Lot II. (equal periods) the percentage of fat is greater in the morning's milk than in the evening's. The actual difference in favour of the better morning's milk for the average of the six weeks is .18 per cent., while in the case of Lot I. (unequal milkings) the morning's milk is on the average of the whole period .68 per cent. poorer than the evening's. The differences are not quite so great as in the previous experiment, but, having regard to the more advanced period of lactation of both lots of cows, is quite consistent. This more advanced lactation period also no doubt partly explains why the actual number of times the milk of cows in Lot I. (unequal periods) only fell six times below the 3 per cent. limit in the morning as compared with twelve in the previous experiment, and once in Lot II. (equal periods) at an evening's milking as compared with twice in the previous experiment. The lowest percentage of fat with both lots of cows was further not so low as in the previous experiment.

TABLE LXXX.—AVERAGE PERCENTAGES OF BUTTER-FAT IN MILK FOR EACH OF SIX WEEKS.

Week ending—	Lot I. Milked at 6 a.m. and at 4 p.m.		Lot II. Milked at 6 a.m. and at 6 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
18th August	3·1	4	3·5	3·3
25th August	3	4	3·77	3·4
1st September	3·1	3·97	3·6	3·8
8th September	3·5	4·1	3·7	3·5
15th September	3·6	3·9	3·8	3·5
22nd September	3·6	3·8	3·9	3·7
Average for each of six weeks	**3·28**	**3·96**	**3·71**	**3·53**
Times milkings were under standard	6	(—)	(—)	1
Highest	4	4·5	4·3	4·6
Lowest	2·8	3·1	3·2	2·9

	Lot I.	Lot II.
Average percentage of butter-fat in total daily yield	3·58	3·61
Total butter-fat in lb. per day	2·59	3·21

TABLE LXXXI.—AVERAGE PERCENTAGES OF SOLIDS NOT FAT IN MILK FOR EACH OF SIX WEEKS.

Week ending—	Lot I. Milked at 6 a.m. and at 4 p.m.		Lot II. Milked at 6 a.m. and at 6 p.m.	
	Morning.	Evening.	Morning.	Evening.
1911.				
18th August	8·8	8·7	8·7	8·7
25th August	8·7	8·5	8·3	8·5
1st September	8·7	8·7	8·6	8·7
8th September	8·7	8·7	8·6	8·6
15th September	8·7	8·7	8·7	8·6
22nd September	8·7	8·6	8·7	8·6
Average for each of six weeks	**8·72**	**8·65**	**8·82**	**8·62**
Times milkings were under standard	6	7	6	5
Highest	9·1	9·1	8·9	8·9
Lowest	8·2	8	8·1	8·2

	Lot I.	Lot II.
Average percentage in total daily yield	8·68	8·61
Total solids not fat in lb. in daily yield	6·29	7·64

SOLIDS NOT FAT.—As already mentioned in the previous experiment there was no very distinct evidence that the drought had seriously affected the percentage of solids not fat in the milk.

In other experiments it has happened that towards the end of the summer, and the commencement of the autumn season, when grass has naturally been poorer and scarcer, the solids not fat in milk have tended to be lower than ordinarily. From 12th August to 22nd September in 1911, in Table LXXXI. it is seen that on thirteen occasions in the case of Lot I. cows and on eleven occasions in that of Lot II. cows, the solids not fat fell below the 8.5 per cent. standard. The lowest percentage was 8. From these somewhat abnormal figures it is possible to deduce that the continued effect of the drought might have had some effect in influencing the quality of the milk, and that where drought effects were much more marked some foundation for complaints about low non-fatty solids may have had some justification.

TABLE LXXXII.—AVERAGE LIVE-WEIGHT (IN LB.) PER COW FOR EACH LOT.

	Commencement of Experiments.	25th July.	21st August.	21st September.	Increase (+) or Decrease (−) during Experiment.
Lot I.	1,218	1,233·4	1,241·8	1,254·4	+36·4
Lot II.	1,142·4	1,148	1,145·2	1,162	+20·8

General Conclusions.

1. It cannot be said that the total quantity of milk is influenced by the equal or unequal periods of milking.

2. So far as the percentage of fat in milk is concerned it is distinctly shown that the length of time between morning and evening milkings does very materially alter it.

3. The results distinctly emphasize the fact that one very important means of getting over the difficulty of poorer morning's milk is to endeavour to make the periods of milking as even as ever possible.

4. It is frequently asserted that the general public demand their milk at such times as to prevent the more general adoption of equal milking periods. If by these and similar experiments it can be shown to the public that equal milking periods produce more even quality of milk, they may in time be sufficiently sympathetic to help the milk producer to get over what is at present a very serious trouble to him.

5. The results again emphasize the necessity in cases of prosecution for selling milk below the standard to take into consideration the desirability of taking an evening as well as a morning sample of milk for analysis before such prosecution is pursued.

6. It is possible that while the percentage of fat remains practically normal under conditions of severe drought the "solids not fat" may be lowered somewhat.

7. In both experiments the cows of Lot I. gave slightly greater percentages of "solids not fat" in the milk. This was probably due to the individuality of the cows comprising this group.

8. The cows which were milked at even periods gave more milk in the evening than in the morning. The evening's milk was also slightly poorer in quality than the morning's. This is contrary to generally accepted experiences, as in ordinary farm practice unequal periods of milking are the rule.

NOTE ON THE VARIATIONS IN THE AMOUNT OF FAT IN MILK DUE TO VARIATIONS IN THE TIMES OF MILKING.

S. H. Collins.

In 1911* I deduced a formula from over 600 tests of milk, which showed that if cows were milked at 6 a.m. and 6 p.m. the evening's milk would be .2 per cent. fat poorer than the morning's milk. If the cows were milked at 6 a.m. and 5 p.m. then the evening's milk would be the richer to the extent of .3 per cent. fat. If milked at 6 a.m. and 4 p.m. the evening's would show .8 per cent. more fat, and if milked at 6 a.m. and 3 p.m. the evening milk would be 1.3 per cent. richer.

The best test of any similar law, based on averages, is to find out if it agrees with facts discovered after the rule has been established.

In the results explained by Mr. Walker it may be seen that in twelve weeks' trials the evening milk (6 p.m.) is poorer than the morning's (6 a.m.) by .25 per cent. fat with equal intervals of milking and that the evening milk (4 p.m.) is richer than the morning milk (6 a.m.) by .80 per cent. fat with unequal intervals. These results are almost exactly what the rule predicts, namely, .25 against .20 and .80 against .80. As regards the weeks taken one at a time, there is only one week with equal intervals, during which the experiment differed from the rule by more than .2 per cent., and there were only three weeks with unequal intervals where the experiment differed from the rule by more than .2 per cent.

If one milking was twelve minutes too late and the next milking twelve minutes too early, there would be a discrepancy of .2 per cent. fat, or the same discrepancy would result from a delay of twenty-four minutes from one milking, the other milk being at correct time. Since accurate timing is quite impossible, the few cases where the experiment appears to depart from the rule may be no departure at all, but merely be the result of the difficulty of accurate time-keeping.

These results confirm many previous ones in various parts of the country and prove conclusively that the percentage of fat in milk depends very largely on the times of milking and that the relationship between times of milking and percentage of fat is a constant one.

Table LXXXIII.—Average Effect of Times of Milking.

Hours of Milking.		Evening Milk will be —
6 a.m. .. 6 p.m.	.. poorer by	·2 % fat than the morning milk.
6 „ .. 5.30 „	.. richer ..	·05 % „ „ „
6 „ .. 5 „	.. „ „	·3 % „ „ „
6 „ .. 4.30 „	.. „ „	·55 % „ „ „
6 „ .. 4 „	.. „ „	·8 % „ „ „
6 „ .. 3.30 „	.. „ „	1·05% „ „ „

* Proceedings of the University of Durham Philosophical Society, Vol. iv., Part 1.

CHAMPION BUTTER-FAT TEST AT THE ROYAL SHOW.

R. T. Archer, Senior Dairy Inspector.

For the first time for many years at the Annual Show of the Royal Agricultural Society, this year a class was instituted for the cow giving the most butter-fat. The competition extended over three days (six consecutive milkings). The conditions were as follow:—

The Weekly Times Champion Butter-fat Test.—Special prizes. First prize, £12; second prize, £8; third prize, £5 (presented by *The Herald* and *Weekly Times* Ltd.).

Each competitor will be allowed three entries in each class, and may nominate a maximum number of ten cows, paying a fee of 1s. per cow at time of entry. The exhibitor may compete with any cow or cows selected from those which he has nominated. The names of all cows nominated must be stated on entry form.

Cow (any pure breed) giving the best butter-fat results under the Babcock test. All exhibits must have been the property of the exhibitor three months before the date of entry. Cows to be milked dry in the presence of the stewards or judges, or whom they may appoint, on Friday, 22nd September, 1916, at 5 p.m., when the exhibits must be in the yards, such milking not to be taken into account. They will be milked at 7 a.m. and 5 p.m. on Saturday, Sunday, and Monday, 23rd, 24th, and 25th September; the milk produced will be subjected to a Babcock test, and the prizes awarded in accordance with the results obtained.

Although it is recognised that as a rule cows will not give their best results at a show in strange surroundings, a perusal of the figures given below will indicate that the competitors gave an excellent account of themselves. The arrangements under which the competing cows were maintained during the contest were favorable, for, although they were in the main cattle pavilion, they were in one corner of the building, and in a wire-netting enclosure, which excluded traffic likely to disturb.

Only five cows were presented for the contest. Two Ayrshires, the property of Mr. Andrew Buchanan, of Gleneira, Flinders, and three red polls, the property of the Department of Agriculture, Central Research Farm, Werribee. The winner was the red poll "Pipio," with 134 lbs. 3 ozs. of milk, an average of 44 lbs. 11 ozs., and 6.222 lbs. butter-fat, thus making 2.074 lbs. of butter-fat per day. On the first evening she gave a higher test than on the two following evenings. The second cow was the Ayrshire, "Lady Mac of Gleneira." She also gave over 2 lbs. of butter-fat per day, and was improving each day, and had the competition extended over another day she would probably have turned the tables on her competitor. "Lady Kyle" of Gleneira was third, with an average of 1.9 lb. of butter-fat per day. "Lady Kyle" gave the most milk, an average of 48 lbs. 3 ozs. per day. "Lady Mac" is by Majestic of Oakbank, by the famous Jamie of Oakbank. Very considerable interest was taken by breeders in the competition, and it is anticipated that next year a large number of entries will result.

The milking operations and collection of samples were carried out by myself, assisted by Mr. B. A. Barr, and the determination of butter fat under the direction of Mr. P. R. Scott, Chemist for Agriculture.

The complete return is as under:—

THE RESULT OF MILKING COMPETITION FOR THE "WEEKLY TIMES" CHAMPION BUTTER-FAT TEST.

No.	Name.	Morning.			Evening.			Total Milk.	Composite Test.	Total Fat.
		Milk.	Test.	Butter Fat.	Milk.	Test.	Butter Fat.			
	23.9.16.	lbs. ozs.	%	lbs.	lbs. ozs.	%	lbs.	lbs. ozs.	%	lbs.
1	Sumatra	23 7	6.1	1.429	15 11	5.55	0.870	39 2	5.61	2.299
2	Pipio	24 6	4.55	1.109	20 2	6 0	1.207	44 8	5.21	2.316
3	Lady Mac of Gleneira	23 14	3.8	0.907	19 5	4.7	0.907	43 3	4.20	2.144
4	Muria	20 2	6.5	1.308	12 14	6.5	0.836	33 0	6.50	1.814
5	Lady Kyle of Gleneira	25 15	3.2	0.830	19 1	4.4	0.838	45 0	3.71	1.668
	24.9.16.									
1	Sumatra	22 13	3.95	0.901	15 13	4.3	0.679	38 10	4.09	1.580
2	Pipio	25 11	4.1	1.053	19 7	4.65	0.903	45 2	4.34	1.956
3	Lady Mac of Gleneira	25 10	3.9	0.999	20 9	4.6	0.945	46 3	4.21	1.944
4	Muria	18 11	5.15	0.962	13 12	5.9	0.811	32 7	5.47	1.773
5	Lady Kyle of Gleneira	27 8	3.8	1.045	20 6	4.35	0.886	47 14	4.03	1.931
	25.9.16.									
1	Sumatra	23 0	3.8	0.874	15 14	4.2	0.666	38 14	3.96	1.540
2	Pipio	25 13	4.0	1.032	18 12	4.9	0.918	44 9	4.38	1.950
3	Lady Mac of Gleneira	28 4	3.7	1.015	20 4	5.2	1.033	48 8	4.33	2.098
4	Muria	17 15	5.0	0.896	13 11	5.9	0.807	31 10	5.39	1.703
5	Lady Kyle of Gleneira	30 14	3 8	1.173	20 13	4.5	0.936	51 11	4.16	2.109

Name.	Grand Total.	
	Milk.	Butter Fat.
	lbs. ozs.	lbs.
1st Pipio (Red Poll)	**134 3**	**6.222**
2nd Lady Mac of Gleneira (Ayrshire) ..	**137 14**	**6.186**
3rd Lady Kyle of Gleneira (Ayrshire) ..	**144 9**	**5.708**
4th Sumatra (Red Poll)	**116 10**	**5.419**
5th Maria (Red Poll)	**97 1**	**5.290**

BREAKING IN HEIFERS.

The breaking in of heifers to the pail is a very important stage in the life of a cow, as upon the management of her at this time depends to a great extent her usefulness as a dairy cow. A writer in the "Farmer and Stockbreeder" points out that if she is badly broken in it will result in her always being fidgety and troublesome at milking time, moving constantly and kicking at her milker. A cow that behaves thus, unless intrusted to a very conscientious and persevering person to milk, is seldom stripped properly, as after a time the milker's patience becomes exhausted, besides which he is apt to stop operations prematurely for fear of the cow turning the full bucket of milk over for the sake of his wanting to extract the last few drops. Moreover, a cow that is irritable and nervous when being milked does not usually let her milk down freely, which habit tends to diminish the supply.

Of course there are a few cows which are naturally not of a placid disposition, and which, even with careful treatment, are nervous and fidgety. But it is more often than not due to insufficient care and patience being exercised when they calve down for the first time. It often happens that down-calving heifers have been grazing on some outlying land, where they seldom see a living soul, and the change from this to a domesticated life when they calve is more than alarming for the heifer. It is not surprising that endless trouble is experienced before they can be taught to stand quietly and be milked. It is far the wisest plan to adopt to bring a heifer up to the farm and let her be tied up with the rest of the milking herd a month or so before she is due to calve. She will then at least be accustomed to the subjection of a chain. During the time which elapses before she calves she should be handled and tamed as much as time permits.

After calving, when suckling her calf, she should have her teats drawn occasionally, and if she is giving more milk than the calf requires, it is a good opportunity to begin milking her, and to do it at the same time as the calf is sucking. She is almost sure to stand quietly while the calf is taking his share, and this will use her to the sensation of being hand-milked almost without her having realized what has taken place. For the first few times it is better not to put a pail under her, but milk on the ground.

STANDARD TEST COWS.

QUARTERLY REPORT FOR PERIOD ENDED 30th SEPTEMBER, 1916.

Altogether 60 cows completed, of which fifteen failed to yield the quantity of fat requisite for a certificate. Unfortunately some cows have again to be left out of the return owing to owners' omission to attend to their registration. The test is confined to pure-bred stock, and only those animals entered in a recognised herd book are eligible, therefore it is necessary for satisfactory evidence to be submitted that any animal tested has been accepted into a herd book before such cow's name, and her return can be published. By omitting to do this, owners

are handicapped to the extent indicated. The following new herds have entered the test:—

T. Mesley, Dalyston (Jersey).
E. Hayes, Archie's Creek (Jersey).
Geo. Rowe, Kardella (Jersey).
J. Scott, East Geelong (Jersey).
W. C. Greaves, Monomeith (Ayrshire).
A. Jackson, Glen Forbes (Jersey).

Individual returns are as follow:—

A. BOX, Hiawatha. (Jersey.)

Completed, 5. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Rosencath Fox's Twylish	3775	8.11.15	15.11.15	273	4	5,735½	5·19	297·72	250	339½
Laurie	3043	23.11.15	30.11.15	273	12½	5,314½	5·16	274·40	250	312½

F. CURNICK, Malvern. (Jersey.)

Completed, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Eva	3770	18.10.15	25.10.15	273	19	6,777	4·70	318·90	250	398¾

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed, 8. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Europa	Not yet allotted	29.9.15	6.10.16	273	11	7,425	4·46	331·20	250	377½
Gallipoli	"	30.9.15	7.10.15	273	14½	6,771½	4·27	289·01	175	329½
La Belle France ..	"	30.9.15	7.10.15	273	19	6,119½	4·50	275·28	175	313⅞
Britannia ..	"	6.10.15	13.10.15	273	12½	6,887	4·10	282·26	250	321½
Egypta	"	17.9.15	17.10.15*	273	15	6,887	4·03	277·41	250	316½
Mahratta	"	20.10.15	27.10.15	273	12½	4,999½	4·89	244·69	175	279
Laurel	"	29.11.15	6.12.15	273	13	5,683½	3·66	208·15	300	237½

* Entry deferred three weeks owing to attack of mammitis.

GEELONG HARBOUR TRUST, Marshalltown. (Ayrshire.)

Completed, 2. Certificated, Nil.

A. W. JONES, Whittington. (Jersey.)

Completed, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
					lbs.	lbs.		lbs.	lbs.	lbs.
Silver Queen II. ..	Not yet allotted	27.8.15	*3.10.15	273	6	4,804½	6·38	306·80	200	349¾
Dolly . ..	3754	3.12.15	10.12.15	273	19	6,838	6·63	452·38	250	516¼

* Entry deferred one month.

C. G. KNIGHT, Cobram. (Jersey.)

Completed, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
					lbs.	lbs.		lbs.	lbs.	lbs.
Royal Rose ..	2585	23.9.15	6.10.15	273	14½	6,518½	5·83	379·78	250	435
Christmas ..	Not yet allotted	18.10.15	25.10.15	273	11½	3,521½	5·42	190·86	175	217½
Princess of Tarnpirr	2986	29.10.15	5.11.15	273	6½	5,744	4·07	208·40	250	306
Idylls Morocco .	Not yet allotted	18.11.15	25.11.15	273	16	4,025½	4·87	196·04	175	223½

AGRICULTURAL HIGH SCHOOL, Leongatha. (Jersey.)

Completed, 6. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
					lbs.	lbs.		lbs.	lbs.	lbs.
Mum	155 C.S.H.B.	18.10.15	28.10.15*	†217	11	5,509	4·78	263·55	200	300
First Choice ..	372 C.S.H.B.	28.10.15	4.11.15	207	4½	2,886½	6·33	182·64	175	284

* Entry deferred three days through weights not being available.
† No weights furnished after 31st May.

C. G. LYON, Heidelberg. (Jersey.)

Completed, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	*lbs.
Silvermine IV. ..	716	4.11.15	11.11.15	269	18	7.415	4·92	364·77	250	415½
Ettie IV.	2889	26.12.15	2.1.16	275	18	8.933½	4·45	397·65	250	453½
Lassie II. ..	1136	26.12.15	2.1.16	273	17½	8.655½	4·91	425·30	250	450½

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Gracious of Glenarthur	2324	28.9.15	*8.10.15	265	4	6.341½	4·11	259·39	250	295½
Marjorie of Retreat	2963	13.10.15	20.10.15	271	8½	7.236½	4·63	335·07	250	382

* Entry deferred three days owing to yields not being recorded.

D. SADLER, Camperdown. (Ayrshire.)

Completed, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Get of Kilmarnock	3092	12.10.15	19.10.15	*268	21	7.088	4·05	287·00	175	327½
Lady Loch of Kilmarnock	3095	14.10.15	21.10.15	243	4½	4.881½	4·28	209·01	200	238½

* Yields not recorded after 12th July.

C. FALKENBERG, Elliminyt. (Jersey.)

Completed, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Fancy of Elliminyt	Not yet allotted	22.10.15	29.10.15	275	10	4,932	4·57	225·41	200	257

W. WOODMASON, Malvern. (Jersey.)

Completed, 21. Certificated, 20.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Daisy VI. of Melrose	Not yet allotted	3.10.15	10.10.15	273	9	5,459½	5·10	279·99	200	319½
Chevy VII. ..	3636	12.10.15	19.10.15	273	12	4,725½	5·77	272·84	250	311
Lassie Fowler V. of Melrose	Not yet allotted	19.10.15	26.10.15	273	12	3,764½	5·62	211·64	175	241½
Peerless IX. of Melrose	,,	19.10.15	26.10.15	273	11½	4,544½	5·25	238·56	175	272
Pearl II. of Melrose	3670	25.10.15	1.11.15	273	12½	5,770½	5·45	314·45	250	358½
Vanilla VII. of Melrose	Not yet allotted	26.10.15	2.11.15	273	14	5,315	5·90	313·89	175	357½
Jessie V. of Melrose	3652	30.10.15	6.11.15	273	10	7,452½	5·25	391·51	250	446½
Flower VI. of Melrose	3641	2.11.15	9.11.15	273	21	7,109½	5·50	390·72	250	445½
Peerless VI. of Melrose	3671	6.11.15	13.11.15	273	11	6,199½	5·65	350·54	250	399½
Handsome Girl VIII. of Melrose	Not yet allotted	8.11.15	15.11.15	273	15	4,971	6·13	304·81	175	352
Rarity VII. of Melrose	,,	8.11.15	15.11.15	273	14	5,181	4·91	254·49	175	290
Cherry VIII. of Melrose	,,	10.11.15	17.11.15	273	20½	5,686½	6·05	344·08	200	392½
Quality VI. of Melrose	3674	11.11.15	18.11.15	273	24	8,327	5·24	436·73	250	497½
Blossom III. of Melrose	3633	19.11.15	26.11.15	273	16	6,631	4·18	277·22	250	316
Edith II. of Melrose	Not yet allotted	27.11.15	4.12.15	273	18½	6,630½	4·73	313·79	200	357½
Mystery XII. of Melrose	3667	27.11.15	4.12.15	273	16	6,628	5·15	341·40	250	389½
Rarity VI. of Melrose	3675	29.11.15	6.12.15	273	18½	8,070½	4·02	390·77	250	453½
Daisy V. of Melrose	3637	12.12.15	19.12.15	273	17½	6,558	5·30	347·81	250	396½
Pleasance V. of Melrose	Not yet allotted	21.12.15	28.12.15	273	17½	4,505	5·25	236·53	200	269½
Fuchsia X. of Melrose	,,	24.12.15	31.12.15	273	21	7,553½	4·26	321·50	200	366½

C. D. LLOYD, Caulfield. (Jersey.)

Completed, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Countess Twyllah ..	928	22.10.15	29.10.15	273	16	7,140	5·02	358·48	250	409½

SAVING FEMALE STOCK—AN ENGLISH OPINION.

All over the United Kingdom, states a contributor to the "Mark-lane Express," flock masters are talking of the especially high prices being realized by sheep, the best making well over 1s. per pound, a price the equal of which has not been enjoyed by the present race of flock owners. "What a profitable occupation this must be," one has heard time after time from the amateur or the urban dweller. "To sell sheep at the price at which they are being sold must mean an enormous profit." The English writer points out that it is not by any means the case that the increased price per pound represents an equal amount of increased profits. Not only are store sheep, which, after all, are the stock-in-trade of the grazier, equally expensive to buy, but every commodity that is needed to produce fat sheep has increased in like measure, and it is more than probable that the profits derivable at the moment by the flock owners are none too large, considering the increased risk and cost incurred.

At the present time, in Australia, it is interesting to note that the English writer remarks that what, perhaps, is of the most serious moment, both for the flock owner and for the country at large, is the danger of a larger number of breeding ewes, or those that become breeding ewes, being slaughtered. It is a big temptation, he remarks, to many a man to know that his ewe tegs, which ought to be kept on to be added to the flock, are worth the money that is so readily paid by the butcher. Far too many, this writer fears, will be tempted to realize and to trust to Providence to replace at a later date.

The same writer says:—"Much was heard last season about the stoppage of the slaughter of ewe lambs. We have heard nothing—or comparatively nothing—this season; yet the need of its emphatic enforcement is far more paramount now than twelve months ago. One has only to look to the moderate supply of mutton to realize the seriousness of the position, for during last month, April, 1916, we actually imported less mutton than we did during that month in the year 1895 by some 34,000 cwt.; yet during the past twenty-five years the population of this country has so largely increased, and the sheep population so strikingly decreased. The position at the moment is the smallest supply of foreign and colonial mutton received for twenty-five years, and the smallest available supply of home grown and fed mutton that we have known for years past."

A leading authority said at a meeting of the Royal Agricultural Society of England twelve months since that the British farmer was able to look after himself; he needed no one to guide him, and if it paid him to breed sheep he would breed them, &c. "That doctrine," the "Mark-lane Express" writer adds, "is all very well, but the British farmer represents but one section of a big community, and it is only reasonable and right that that community should take care to look after its best interests, and those interests unquestionably at the present time require that every sheep capable of being added to the breeding stock of this country should be saved, and none slaughtered either as lambs, or yearlings, or any other age, except such as are barren, toothless, or otherwise defective and undesirable for breeding purposes."

VICTORIAN RAINFALL.

Third Quarter, Year 1916.

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	145	245	308	698
	Normal	90	104	128	322
	Per cent. above normal	61	136	141	117
	„ below „	..	..	..	..
Mallee South	District Mean.. ..	178	210	333	721
	Normal	116	128	140	384
	Per cent. above normal	53	64	138	88
	„ below „	..	..	..	..
North Wimmera ..	District Mean.. ..	225	301	321	847
	Normal	154	171	176	501
	Per cent. above normal	46	76	82	69
	„ below „	..	..	..	..
Sonth Wimmera ..	District Mean.. ..	252	310	323	885
	Normal	207	216	217	640
	Per cent. above normal	22	44	49	38
	„ below „	..	..	..	..
Lower Northern Country	District Mean.. ..	239	249	459	947
	Normal	152	164	152	468
	Per cent. above normal	57	52	202	102
	„ below „	..	..	..	..
Upper Northern Country	District Mean.. ..	287	287	605	1,179
	Normal	184	196	183	563
	Per cent. above normal	56	46	231	109
	„ below „	..	..	..	..
Lower North-East ..	District Mean.. ..	601	477	435	1,513
	Normal	284	257	258	799
	Per cent. abo e normal	112	86	69	89
	„ below „	..	..	..	..
Upper North-East ..	District Mean.. ..	788	807	729	2,324
	Normal	456	437	427	1,320
	Per cent. above normal	73	85	71	76
	„ below „	..	..	..	..
East Gippsland ..	District Mean.. ..	379	171	632	1,182
	Normal	234	209	275	718
	Per cent. above normal	62	..	130	65
	„ below „	..	18	..	..
West Gippsland ..	District Mean.. ..	193	325	722	1,240
	Normal	290	365	353	948
	Per cent. above normal	..	7	105	31
	„ below „	33	..	..	..

VICTORIAN RAINFALL—*continued.*

District.		July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
East Central	District Mean	219	356	792	1,367
	Normal	282	284	326	891
	Per cent. above normal	..	25	143	53
	,, below ,,	22	..	..	..
West Central	District Mean	201	241	922	1,372
	Normal	194	200	251	645
	Per cent. above normal	8	20	267	113
	,, below ,,	..	..	..	..
North Central ..	District Mean	521	441	698	1,468
	Normal	258	258	264	780
	Per cent. above normal	28	71	164	88
	,, below ,,	..	..	..	..
Volcanic Plains ..	District Mean	237	273	544	1,054
	Normal	220	229	273	722
	Per cent. above normal	8	19	99	46
	,, below ,,	..	..	..	..
West Coast	District Mean	254	387	415	1,056
	Normal	328	314	325	967
	Per cent. above normal	..	24	28	9
	,, below ,,	23	..	..	..

N.B.—100 points = 1 inch.

9th October, 1916.

July rains were very heavy in the northern parts of the State, and somewhat below average in southern areas; but, on the whole, the rains were generally of a useful nature, and were much more than were required in the North-Eastern districts. They were mostly the effects of combined antarctic and tropical influences, and consequently were most heavy in the eastern parts, causing floods on the Ovens River. Stock were generally in good condition throughout, there being an abundance of feed, and lambing results exceptionally favorable. In the Lismore district and neighbouring plains, and also in the vicinities of Geelong and Werribee, a partial drought has taken place, and crops appear to be at a standstill, and quite a contrast compared with the ideal conditions that prevail elsewhere. Wet and humid weather generally were the chief characteristics of August, the whole State received an abundant rainfall, more particularly north of the Dividing Range, the great storms being mainly tropical. Most of the rivers were in flood, and although crop prospects were excellent, a superabundance of moisture had diminished the prospective yield here and there in northern districts. The Werribee to Geelong, and almost to Ballarat farmers were still experiencing the effects of the drought in those parts, and more rain was needed. Stock throughout were in excellent condition.

September was remarkable for its heavy and continuous rains during the latter part of the month, and as all rivers were in flood, much anxiety was felt especially on the Murray tributaries, and much damage to crops and loss of stock resulted. In the central district where in parts crop prospects were far from bright the heavy rains caused a more cheerful outlook, and here, as elsewhere, not including some places where flooding had damaged growth, the expected results of the approaching harvest seemed to be of at least as cheerful a character as they were twelve months ago, and promised to outstrip even the record crops of last year. Stock were excellent throughout the State. Balook, in Gippsland, holds the record for the greatest monthly rainfall, viz., 22.25 inches, and Melbourne's total, 7.93 inches, established a record for any month during the past sixty-one years.

H. A. HUNT,
Commonwealth Meteorologist.

3rd November, 1916.

To Bottle Peas.—The peas must be gathered while young. Choose those of a good cooking variety, shell them, and immediately throw them into boiling water to which some salt has been added. Allow the peas to boil two minutes, then strain, and fill the bottles with the peas and the water in which they were boiled. Place the glass stoppers loosely on the bottles, then stand them in the sterilizer, the water in which should be warm; gradually bring to the boil, and allow them to boil for five minutes. Take out the bottles and screw down quickly.

A LEGAL decision was recently given in an English court as to when a lamb becomes a sheep. The question arose out of the killing of some sheep on a railroad by a passing train, and it was denied that the complaint was properly made, the animals being lambs, and not sheep. The judge decided that the lambs ceased to be lambs and became sheep as soon as they acquired their first pair of permanent teeth. Apparently he did not consider the question of when a lamb became a hogget, which, generally speaking, is between the time the lamb is weaned and when it is shorn.

THE recent outbreak of foot-and-mouth disease in the United States has proved the most serious the country has ever experienced. Up to 1st January it had cost the Government over £400,000, and about £500,000 of Federal Government funds were available a month or so ago for use in the eradication of the disease. Up to the end of 1914 101,000 animals had been slaughtered, which had cost the Government about £350,000 in reimbursements to the owners for their losses. The most serious trouble has been in Illinois, her loss to 1st January being 37,000 animals altogether. Pennsylvania is next, with nearly 18,000 head, and Ohio third, with a little over 10,000 head.

SIXTH VICTORIAN EGG-LAYING COMPETITION, 1916-1917.

Commenced 15th April, 1916; concluding 14th April, 1917.

CONDUCTED AT THE BURNLEY SCHOOL OF HORTICULTURE BY THE DEPARTMENT OF AGRICULTURE, VICTORIA.

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.10.16	15.10.16 to 14.11.16	Total to Date (Seven months).	Position in Competition.
		LIGHT BREEDS.				
		WET MASH.				
1	O. McDonnell	White Leghorns ..	772	144	916	1
10	J. H. Duncan	,, ..	760	150	910	2
13	H. J. Meaddows ..	,, ..	751	149	900	3
36	E. W. Hippe	,, ..	730	152	882	4
7	C. J. Jackson	,, ..	728	139	867	5
40	A. Brundrett	,, ..	716	147	863	6
41	Excelsior Poultry Farm ..	,, ..	714	146	860	7
37	J. M. Smith	,, ..	707	151	858	8
23	A. H. Mould	,, ..	740	116	856	9
22	Mrs. H. Stevenson ..	,, ..	706	147	853	10
38	V. Little	,, ..	710	138	848	11
3	W. M. Bayles	,, ..	687	158	845	12
28	S. Cheatle	R.C.B. Leghorns ..	690	148	838	13
44	J. Jamieson	White Leghorns ..	685	143	828	14
15	G. Laughlan	,, ..	687	141	828	
17	W. G. Swift	,, ..	685	138	823	16
27	John Blacker	,, ..	679	124	803	17
45	C. H. Oliver	,, ..	661	131	792	18
32	N. Burston	,, ..	648	144	792	
23	T. A. Pettigrove ..	,, ..	654	137	791	20
14	W. R. Hustler	,, ..	656	133	789	21
39	L. McLean	,, ..	636	147	783	22
24	Mrs. H. N. H. Mirams ..	,, (5 birds)	666	114	780	23
29	A. S. Hyndman ..	,, ..	614	156	770	24
12	G. Hayman	,, ..	624	145	769	25
11	R. W. Pope	,, ..	621	146	767	26
18	C. Ludwig	,, ..	630	137	767	
8	E. A. Lawson	,, ..	601	162	763	28
34	F. G. Silberelsen ..	,, ..	632	127	759	29
43	S. Buscumb	,, ..	597	160	757	30
30	F. T. Denner	,, ..	636	116	752	31
16	F. Collings	,, ..	617	134	751	32
6	J. J. West	,, ..	619	132	751	
26	Mrs. A. Dumas	,, (5 birds)	602	136	738	34
101	A. E. Silberelsen ..	,, (5 birds)	595	124	719	35
19	Renwerren Egg Farm ..	,, ..	562	138	700	36
5	W. G. Osburne	,, ..	526	140	666	37
35	Tom Fisher	,, ..	493	152	645	38
20	H. L. Merrick	,, ..	493	129	622	39
33	E. F. Evans	,, ..	484	131	615	40
9	W. H. Clingin	,, ..	482	129	611	41
4	Fulham Park	,, ..	439	149	588	42
31	J. H. Gill	,, ..	408	151	559	43
		Total ..	27,343	6,029	33,372	
		HEAVY BREEDS.				
		DRY MASH.				
98	Maryille Poultry Farm ..	Black Orpingtons ..	795	121	916	1
97	D. Fisher	,, ..	736	130	866	2
100	Oaklands Poultry Farm ..	,, ..	734	126	860	3
94	Mrs. H. Cead	,, ..	619	107	726	4
95	Mrs. T. W. Pearce ..	,, ..	619	101	720	5
96	H. Hunt	,, ..	542	136	678	6
99	J. Ogden	,, ..	397	103	500	7
		Total ..	4,442	824	5,266	

Sixth Victorian Egg-Laying Competition, 1916–1917—*continued.*

Six Birds. Pen No.	Owner.	Breeds.	15.4.16 to 14.10.16	15.10.16 to 14.11.16	Total to Date (Seven months).	Position in Competition.
		LIGHT BREEDS.				
		Dry Mash.				
46	W. H. Robbins ..	White Leghorns ..	840	147	987	1
52	W. J. Thom	,, ..	814	165	979	2
59	T. A. Pettigrove ..	,, ..	810	124	934	3
53	W. N. O'Mullane ..	,, ..	770	159	929	4
70	G. Wilkinson	,, ..	743	143	886	5
54	Mrs. A. O. Hughes ..	,, ..	718	151	869	6
47	H. McKenzie and Son ..	,, ..	736	130	866	7
58	C. Ludwig	,, ..	744	110	854	8
65	Izard and Tierney ..	,, ..	712	136	848	9
56	Mrs. Nicoll	,, ..	737	110	847	10
62	H. W. Morrow	,, ..	686	131	817	11
69	E. A. Lawson	,, ..	657	152	809	12
55	Rev. J. Mayo	,, ..	652	157	809	
61	C. C. Dunn	,, ..	696	105	801	14
48	Thirkell and Smith ..	,, ..	643	134	777	15
60	A. Greenhalgh	,, ..	624	149	773	16
67	Lysbeth Poultry Farm ..	,, ..	621	150	771	17
63	N. Burston	,, ..	610	159	769	18
66	Benwerren Egg Farm ..	,, ..	555	157	712	19
50	Clevedon Poultry Farm ..	,, ..	549	144	693	20
49	C. Lane	,, ..	535	127	662	21
51	Reliable Poultry Farm ..	,, ..	549	142	691	22
64	A. Bannett	,, ..	499	140	639	23
68	W. O. Osburne	,, ..	452	131	583	24
		Total ..	15,982	3,353	19,335	
		HEAVY BREEDS				
		Wet Mash.				
74	Oaklands Poultry Farm ..	Black Orpingtons ..	859	122	981	1
89	Brooklyn Poultry Farm ..	,, ..	761	105	866	2
87	S. Busemb	,, ..	749	114	863	3
92	J. H. Wright	,, ..	720	128	848	4
86	C. Ludwig	,, ..	716	131	847	5
85	Mrs. M. Coad	,, ..	733	105	838	6
80	Mrs. T. W. *Pearce* ..	,, ..	705	122	827	7
90	Excelsior Poultry Farm ..	,, ..	681	134	815	8
88	A. D. McLean	,, ..	702	96	798	9
83	L. McLean	,, (5 birds)	690	96	786	10
91	N. Papayanni	,, ..	649	125	774	11
93	L. W. Parker	,, ..	649	114	763	12
72	Marville Poultry Farm ..	,, (5 birds)	651	90	741	13
78	Reliable Poultry Farm ..	,, (4 birds)	637	87	724	14
77	Mrs. G. R. Bald ..	White Plymouth Rocks	589	123	712	15
81	K. Courtenay	Faverolles ..	565	137	702	16
71	C. E. Graham	Black Orpingtons ..	532	131	663	17
84	H. L. Trevana	Rhode Island Reds	535	128	663	
76	L. A. Errey	Silver Wyandottes	511	98	609	19
73	E. W. Hippe	Rhode Island Reds	513	68	581	20
82	J. Ogden	Black Orpingtons ..	469	112	581	
75	Mrs. Drake	Rhode Island Reds	427	113	540	22
		Total ..	14,043	2,479	16,522	

Report.

The weather conditions for the past month have been very bad for egg production, being especially severe on birds in open yards. All houses have been disinfected and supplied with clean straw during the month, with a view to additional comfort for the birds. The egg yield is somewhat lower than for the corresponding term last year, which is to be expected. Broodies have been plentiful lately, the Leghorns transgressing in this respect, being more numerous than usual. Rainfall for month 355 points. Temperature, lowest, 43 deg. Fahr.; highest, 78 deg. Fahr.

A. HART,
Chief Poultry Expert.

Department of Agriculture,
Melbourne, Victoria.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

As a preventive against codlin moth, apple and pear trees should be sprayed with arsenate of lead whenever there is danger from the prevalence of the moth. One of the secrets of success in codlin moth spraying is the destruction of as many as possible of the insects of the first brood. Thus, if particular care is given to the early sprayings, keeping the fruit covered with spray for a month or six weeks after setting, this result is easily accomplished. Some growers prefer to gather all fruit infected by the first brood, spraying only for the second and later broods. Even if all the fruits attacked are gathered, which very rarely happens, the grower suffers from the loss of fruit, which he can ill afford, unless his crop be a heavy one.

Another feature for consideration is the fact that the presence of any arsenical spray on the foliage is responsible for the destruction of the pear and cherry slug, root-borer beetle, and all forms of leaf-eating insects.

Spraying the cherries for the slug will now be necessary. Arsenate of lead may be used, provided the fruit is not far advanced. Hellebore, and also tobacco water, are effective against this pest.

Cultivation.

All orchard soils should be kept well worked during the summer months. It is very essential that the trees should have an abundant supply of moisture during the whole of the growing season. The incessant rains that have fallen during the past months have given the subsoil a splendid soaking, which will benefit the trees considerably, and although the rain has very considerably interfered with the setting of

the fruit crops, it will be very beneficial in the promotion of a vigorous growth to the trees. This will mean an increased supply of fruit buds for the next season, consequently the frequent summer cultivation of the soil will be a necessity if the health and vigour of the trees are to be maintained.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture, and are not able to obtain or retain sufficient for their nourishment: they then very soon wither and die. The soil around these should always be kept well stirred; they may also be given a good straw or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to keep up a good loose earth mulch during the whole season, and to keep down all weeds and useless orchard growths.

Pruning.

Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree, and to increase the development of new fruit buds.

The Vegetable Garden.

Tomatoes will require a good amount of attention at this time of the year. If the plants have been well looked after, they should be making vigorous growth. It will be to advantage to tie the plants to stakes, training them to two or three main growths, and pinching out all laterals as they come.

The plants should be well watered, and occasionally a handful of bonedust and blood manure mixed should be forked in around the roots. Where stable manure is used, it should be used as a mulch, forking it in every three or four weeks, and making a fresh mulch.

All plants of the cucumber and melon family should now be constantly supplied with ample water. Pinch out unnecessary lateral growths, and also the terminals.

The following seeds may now be sown:—French beans, cabbage and cauliflower for winter crops, parsnip, lettuce, and celery.

The side shoots of celery plants should be removed, afterwards earthing up the plants. Asparagus beds should be top-dressed, and allowed to grow without any more cutting. The vegetable beds will need frequent forking and hoeing to keep the soil sweet, and to keep down all weeds.

The Flower Garden.

Plant out dahlias this month; tubers early, and plants grown from cuttings for exhibition blooms later in the month. Water well at planting, and keep well cultivated afterwards.

Rose bushes and beds may be given a good mulch with light stable manure, straw, grass, or lawn clippings. The beds should be kept rather dry, so as to allow the plants to rest before the autumn period of growth.

Sow seeds of cosmos, asters, zinnia, balsams, cockscomb, and other late summer and autumn blooming annuals.

Cut down delphiniums that have yielded their first crop of flowers, so as to allow a succession of flowers to come.

Daffodil, hyacinth, tulip, ranunculus, anemone, and other bulbs and tubers may be taken up and stored; while gladioli corms may still be planted.

The garden must be kept well watered and cultivated, so as to tide the plants over the hot and dry season.

Bacterial Disease of Rose.

In these notes for November, 1915, attention was drawn to the considerable increase of a new disease in roses, which was determined by Mr. Brittlebank to be of bacterial origin. The young shoots and leaves began to shrivel, turning black and finally dying, and then the main shoot would die, and lastly the whole plant. As a result of investigation during the past season, it has been found that the painting with a strong brush of the plants affected with a solution of permanganate of potash is exceedingly beneficial to the plants, several rose bushes having made good recovery as a result of the applications.

The potash should be used at the rate of half-an-ounce to the gallon of water. In brushing the stems care should be taken that the solution does not drop to any extent on the foliage. Three or four applications will be necessary, with an interval of about a fortnight between each one.

REMINDERS FOR JANUARY.

LIVE STOCK.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares* should be well fed on succulent food if available; otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide succulent fodder and plenty of clean water and shade. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron ½ lb. Limewash the cow bails, it helps to keep down flies. Provide calves, if possible, with good grass run, or lucerne hay or oats in a trough.

Pigs.—Supply short bedding in warm, well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate

trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal per 100 lbs. live weight in food daily. If pigs are lousy, dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now. Plenty of water should be available for them to wallow in in hot weather.

SHEEP.—Ewes, after a season such as this, will come in season well to time. Merino and fine comebacks, November and December; crossbreds, January and February; pure British breeds, February and March. Be sure of ample rams running with them. Breed from every good ewe possible. Keep in view wool production as well as lamb and mutton. Meat and wool will be amongst the foremost commodities in demand for several years. Two-tooth ewes, if well grown, can be bred from, but they should be well treated throughout. Use rams with width and substance, and never inferior-fleeced ones. Rams work best at night and early morning. With large paddocks it may be necessary to yard occasionally in a season like this. Purgative drenches, worm pills, &c., should be given to all lambs, weaners, or grown sheep showing unhealthy discharge, for this is the chief attraction to the fly.

POULTRY.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green food; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily. Moisten dust bath.

CULTIVATION.

FARM.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

ORCHARD.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

VEGETABLE GARDEN.—Plant out all seedlings, when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabbi, &c.

FLOWER GARDEN.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

VINEYARD.—Summer butt or *Yema* grafting may be practised in January, though February is the usual month. This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain or sulphuring in case of odium, that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

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